"CLINICO-MYCOLOGICAL STUDY OF DERMATOPHYTOSIS AT A TERTIARY CARE HOSPITAL"

Submitted by

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LIST OF ABBREVIATIONS

M. audouinii	*Microsporum audouinii*
M. ferrugineum	*Microsporum ferrugineum*
M. canis	*Microsporum canis*
M. gallinae	*Microsporum gallinae*
M. equinum	*Microsporum equinum*
M. nanum	*Microsporum nanum*
M. persicolor	*Microsporum persicolor*
M. gypseum	*Microsporum gypseum*
T. concentricum	*Trichophyton concentricum*
T. tonsurans	*Trichophyton tonsurans*
T. violaceum	*Trichophyton violaceum*
T. interdigitale	*Trichophyton interdigitale*
T. rubrum	*Trichophyton rubrum*
T. schoenleinii	*Trichophyton schoenleinii*
T. equinum	*Trichophyton equinum*
T. simii	*Trichophyton simii*
T. mentagrophytes	*Trichophyton mentagrophytes*
T. verrucosum	*Trichophyton verrucosum*
T. ajeloii	*Trichophyton ajeloii*
E. floccosum	*Epidermophyton floccosum*
TLR	Toll like Receptor
IL	Interleukin
DTH	Delayed type hypersensitivity

Th cell	T helper cell
CMI	Cell mediated immunity
IgE	Immunoglobulin E
IgG4	Immunoglobulin G4
DLSO	Distal and Lateral subungual onychomycosis
PSO	Proximal subungual onychomycosis
WSO	White superficial onychomycosis
EO	Endonyx onychomycosis
TDO	Total dystrophic onychomycosis
T. soudanense	*Trichophyton soudanense*
KOH	Potassium Hydroxide
PCR	Polymerase Chain Reaction
MALDI-TOF	Matrix assisted laser desorption ionization time of flight
NaOH	Sodium Hydroxide
SDS	Sodium dodecyl sulfate
RAL	Reichs-Ausschuß für Lieferbedingungen und Gütesicherung
CBE	Chlorazol Black E
GMS	Grocott-Gomori's Methenamine Silver
PAS	Periodic Acid Schiff
SDA	Sabouraud's Dextrose Agar
DTM	Dermatophyte test media
PCR-ELISA	Polymerase Chain Reaction- Enzyme Linked Immunosorbent Assay
AFA	Antifungal Agents

OD	Once Daily
BD	Twice Daily
MIC	Minimum Inhibitory Concentration
ATP	Adenosine Triphosphate
CARD9	Caspase recruitment domain containing protein 9
SD	Standard Deviation
HIV	Human Immunodeficiency Virus
TB	Tuberculosis
RVD	Retroviral Disease
BA	Bronchial Asthma
BSA	Body Surface Area

ABSTRACT

Background

Dermatophytosis is a superficial fungal infection of keratinized tissue. Dermatophytes are a specialized group of fungi causing dermatophytosis that affects skin, hair, and nail. The evolution of the dermatophytes is constantly influenced by the geographic and socioeconomic conditions. The disease has a high carriage rate thus affecting a majority of people and also leading to chronicity and frequent relapses among patients. The disease is associated with significant morbidity and poor quality of life

Objective

To determine the epidemiological trends of dermatophytosis among patients attending skin OPD at a tertiary care centre and also to study the clinical types and its relation to lifestyle, occupation, and co-morbidities.

Methodology

It is a hospital-based cross sectional study. A total of 384 patients with clinical suspicion of dermatophytosis were enrolled in the study irrespective of age and gender. Detailed history about age, duration of disease, occupation, socioeconomic status, past history of medication and consultation, personal and family history were recorded from the patients. The Patients were examined to determine the clinical type of dermatophytosis. Specimen(skin scraping, hair, or nail clippings) for microbiological investigations was collected from the lesion. It was utilized for preparing a 10% KOH mount for direct microscopy for visualization of fungal hyphae. Irrespective of KOH mount result, the specimen was also inoculated in 3 media, Sabouraud dextrose agar without chloramphenicol and cycloheximide(SDA), Sabouraud dextrose agar with Chloramphenicol, and cycloheximide(SDA with antibiotics) and Dermatophyte test media(DTM). It was further sent to the microbiology laboratory for the purpose of incubation and isolation of species.

Result

The most commonly affected age group in this study was 30-39 years with male predominance. Maximum patients (42.2%) presented with 1-2 months duration of the lesion with half of the patients having history of self-medication. Past history of similar complaints was observed in 20% of the patients and One third (1/3rd) of the patients had similar complaints among family members or close contacts. Tinea corporis was the most common clinical diagnosis followed by tinea cruris. Tinea corporis with tinea cruris was the commonest presentation among the mixed type of dermatophytosis. Direct microscopy of a 10% KOH mount demonstrated fungal hyphae in 82.6% of patient's samples and culture positivity seen was 57%. *Trichophyton mentagrophyte*(43.84%) was the most common specie isolated followed by *Trichophyton rubrum*(37.90%).

Conclusion

An epidemiological study helps to understand the complex interplay betweeen host, environment, and agent factors. Dermatophytoses has emerged as a rampant infection in the recent past with many atypical, recalcitrant and difficult to treat cases. This study helps to determine the epidemiological trends, the nature of the disease, the predisposing factors and the causative species.. Hence, a mycological study helps in identifying and understanding the various factors related to the disease as it varies from place to place and time to time, thereby helps in containing the epidemic of an infectious diseases such as dermatophytosis.

Keywords- Dermatophytosis, *T. mentagrophyte*

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INTRODUCTION

Dermatophytosis is an infection occurring in humans and other animals produced by a group of closely related fungi termed as dermatophytes, as a result of their invading capacity. It is commonly referred to as tinea. The incapability of the fungi to penetrate deeper tissue or organ restricts the infection to keratinized tissue (skin, hair or nail).[1,2,3]

The prevalence of dermatophytosis is constantly rising. It is most evident in tropical countries with the co-occurrence of a vast number of difficult to treat cases.[4] It also attributes to one of the most commonly encountered condition in a dermatology practice in India. This may be due to multiple favoring factors like hot and humid climate, poverty, poor hygiene, migration, and socioeconomic factors like overcrowding. [5,6] The high carriage rate, leads to the occurrence of the disease in a large number of people, and many patients tend to have a protracted course. Frequent relapses of the disease lead to significant morbidity and poor quality of life.[7]

Presently, the leading pathogenic fungi causing dermatophytosis is the *Trichophyton rubrum* followed by *Trichophyton mentagrophytes*. This trend is seen in India which is well evident through epidemiological studies.[7,8] Lately, *Epidermophyton floccosum, Microsporum audouinii,* and *Trichophyton schoenleinii* are limited to some less developed countries, which were major pathogens causing dermatophytosis a few decades ago.[7]

Of late, there has been an overwhelming rise in patients presenting with atypical clinical types of dermatophytosis such as the circumscribed scleroderma like, crusted circular plaques, white paint-like dots, psoriasis-like lesions, or dystrophic onychomycosis due to *Microsporum gypseum* infection.[7]

Dermatophytosis management has become a great therapeutic challenge, with a lack in research, in the area of disease pathophysiology and management.[9,10] Once a most trivial cutaneous infection to treat has now become a major public health issue.[7] Even though the problem of

recalcitrant dermatophytosis is growing leaps and bounds in India, there is a large void in the published epidemiological, clinical, and laboratory research in this field .[7]

For effective management of this condition, the study of their risk factors and predisposing factors is much needed.[10] This clinico- epidemiologic study helps to clarify the determinants of the trends associated with dermatophytoses at the tertiary health care centre and the general public health burden of the illness.

OBJECTIVES OF THE STUDY

1. To determine epidemiological trends of dermatophytosis among patients attending skin OPD at the tertiary care hospital

2. To study the clinical types and its relation to lifestyle, occupation and co-morbidities.

REVIEW OF LITERATURE

Dermatophytosis is a superficial fungal infection that is generally cutaneous and restricted to the non-living cornified layers.[1] The fungal infection is termed tinea, whereas fungal organisms that cause tinea are referred to as dermatophytes.[11] Due to the ring-like appearance of these infections and also due to lack of knowledge regarding the true etiology of these diseases as far back as 16th century, they were generally referred as ringworm, which continues to be in use even today as a lay term for dermatophytosis.[1]

History

'De Re Medicina' written around 30 A.D, by Aulus Cornelius Celsus, a Roman encyclopedist, is known for the first recorded reference to a dermatophytic infection who described a suppurative infection of the scalp that came to be known as the kerion of Celsus .[12,13]

It was in the 19th century that a mycotic etiology was discovered for these skin diseases.[12]

- In 1837 Robert Remak, a Polish physician on the medical faculty of Berlin University, noted hyphae in the crusts of the disease known as favus.[12,14]
- Remak credited this recognition to Scho¨nlein, as he claimed that he did not recognize the structures as fungal. Scho¨nlein described their mycotic nature in 1839. [12]
- However, the etiologic agent of favus was established by Remak as infectious and cultured it on apple slices. In honor of his mentor and his initial discovery, he validly described it as *Achorion schoenleinii* .[12]
- In 1841 David Gruby, the real founder of dermato-mycology, a Hungarian physician independently confirmed Remak's discovery. Gruby also discovered and named the genus Microsporum in 1843 and described *M. audouinii* based on the appearance of the fungus in clinical materials.[12]
- In 1845, Hendrik Malmsten, a Swedish investigator described Trichophyton, which is the second genus.[12]
- In 1910, Epidermophyton, the third was described by Raymond Sabouraud.[12]

It was in 1886 that the pure cultures of the dermatophytes were described independently by Grawitz in Germany and Ductaux in France.

Etiological agent:

The dermatophytes

Evolution has made the mycelial and keratinophilic fungi of the mold group, dermatophytes to adapt themselves to animal and human parasitism which was originally saprobic.[15]

Dermatophytes are classified as follows:

Kingdom: Fungi

Phylum: Ascomycota

Order: Onygenales

Genus: Arthroderma, Nannizzia

They reproduce sexually, asexually, or both. Based on stages in the life cycle, these fungi are classified as the anamorphic and the telomorphic state.[15]

- **Anamorphic state** - undergo asexual or somatic reproduction and has a distinct morphology
- **Teleomorph state** - undergo sexual reproduction, morphologically differentiated from the anamorph.

Asexual reproduction is perceived mostly in clinically encountered fungi.[15]

According to Botanical taxonomy, the fungi are divided into four major divisions:

- *Zygomycota*
- *Ascomycota*
- *Basidiomycota*
- *Deuteromycota*

Out of these, the majority of pathogenic fungi belong to *Deuteromycota*. Septate hyphae and asexual reproduction with the formation of conidia are noticed in these fungi. The keratinolytic ability of these pathogenic fungi has been attributed to its ability to penetrate the natural keratin.[15]

Emmons, (1934) was the first individual to classify dermatophytes into three anamorphic (asexual, imperfect) genera[15]

- *Epidermophyton*
- *Microsporum*
- *Trichophyton*

These organisms are pathogenic members of the keratinophilic (keratin digesting) soil fungi.[15]

Several reviewers updated this classification with new species. On the basis of anamorphic morphology, 2 species in *Epidermophyton*, approximately 18 species in *Microsporum* and 25 species in *Trichophyton* are considered as members of these genera.[15]

Epidermophyton

The genus, *Epidermophyton* was established by Sabouraud in 1910 who also discovered the specie *Epidermophyton rubrum*.[15] They are the best example of anthropophilic dermatophytes.[12] *Epidermophytons* possess massive conidia that have thin-walled and clustered branches. Microconidia are pyriform, about 2 - 3µm. Among the two known species of this genus til date, only *E. floccosum* is pathogenic.[1]

Trichophyton

Malmsten in 1845, identified the genus *Trichophyton* with the discovery of species *T. tonsurans.* It is identified by an abundance of microconidia compared to macroconidia. Globose, pyriform /clavate, or sessile/stalked, microconidia are seen and are borne either singly along the sides of the hyphae or in grape-like clusters. Macroconidia, if present appear as smooth, usually thin-walled, with 1-12 septa, borne singly or in clusters, and may be of any shape like elongated and pencil-shaped, clavate, fusiform, or cylindrical.[15]

Microsporum

Macroconidia usually show the presence of rough walls which may be asperulate, echinulate, or verrucose .[1] Macroconidia may be thin, moderately thick to thick-walled with 1 to 15 septa. While microconidia are typically sessile or stalked and clavate. They are usually arranged singly along the hyphae or in racemes.[1]

Genera	Skin	Hair	Nail
Epidermophyton	+	-	+
Trichophyton	+	+	+
Microsporum	+	+	-

Table 1: Patterns Of Infections By Dermatophytes [16]

Classification Based on ecological characteristics

Dermatophytes are classified into three habitual species as:[15]

- Anthropophilic
- Zoophilic
- Geophilic

	Anthropophilic	**Zoophilic**	**Geophilic**
Natural habitat	One of the most prevalent fungi in the urban population, especially in developed countries.	The animal keratin substratum is usually attacked by these dermatogens.	These saprophytic dermatophytes are soil habitual fungi.
Host	Humans acquire directly or indirectly	Pets, farm animals, or wild animals form the major reservoirs of these fungi.	Natural factors such as soil pH, temperature, humidity, environmental light, climate, chemical composition and amount of organic material in the soil affect the presence of these typical dermatogens in nature.
Clinical feature	It is principally noticed in schools and prisons.	Dairy farming workers and children being mainly at risk, due to their regular contact with farm animals, as well as wild animals.	Infects both humans as well as animals.

Table 2: Features Of Dermatophytes Based On Ecology [17]

Anthropophilic species	**Zoophilic species**	**Geophilic species**
Microsporum *M.audouinii, M. ferrugineum*	***Microsporum*** *M. canis, M. gallinae, M. equinum,*	***Microsporum*** *M. nanum, M. persicolor, M. gypseum,*
Trichophyton *T. concentricum* *T. tonsurans* *T. violaceum* *T. interdigitale* *T. rubrum* *T. schoenleinii*	***Trichophyton*** *T.equinum,* *T. simii,* *T.mentagrophytes,* *T. verrucosum*	***Trichophyton*** *T. ajeloii*
Epidermophyton *E.floccosum*		

Table 3: Species Of Dermatophytes Based On Ecology [18]

Pathogenesis

A complex interaction between host, agent, and environment leads to the manifestation of dermatophytoses

Host Factors

Various host factors influence the occurrence of dermatophytosis. Age of the patient, site of invasion, obesity, physiological variations in the host skin barrier, immunosuppressive state, and acquired conditions such as excessive washing or sun exposure are few of the predisposing factors.[7]

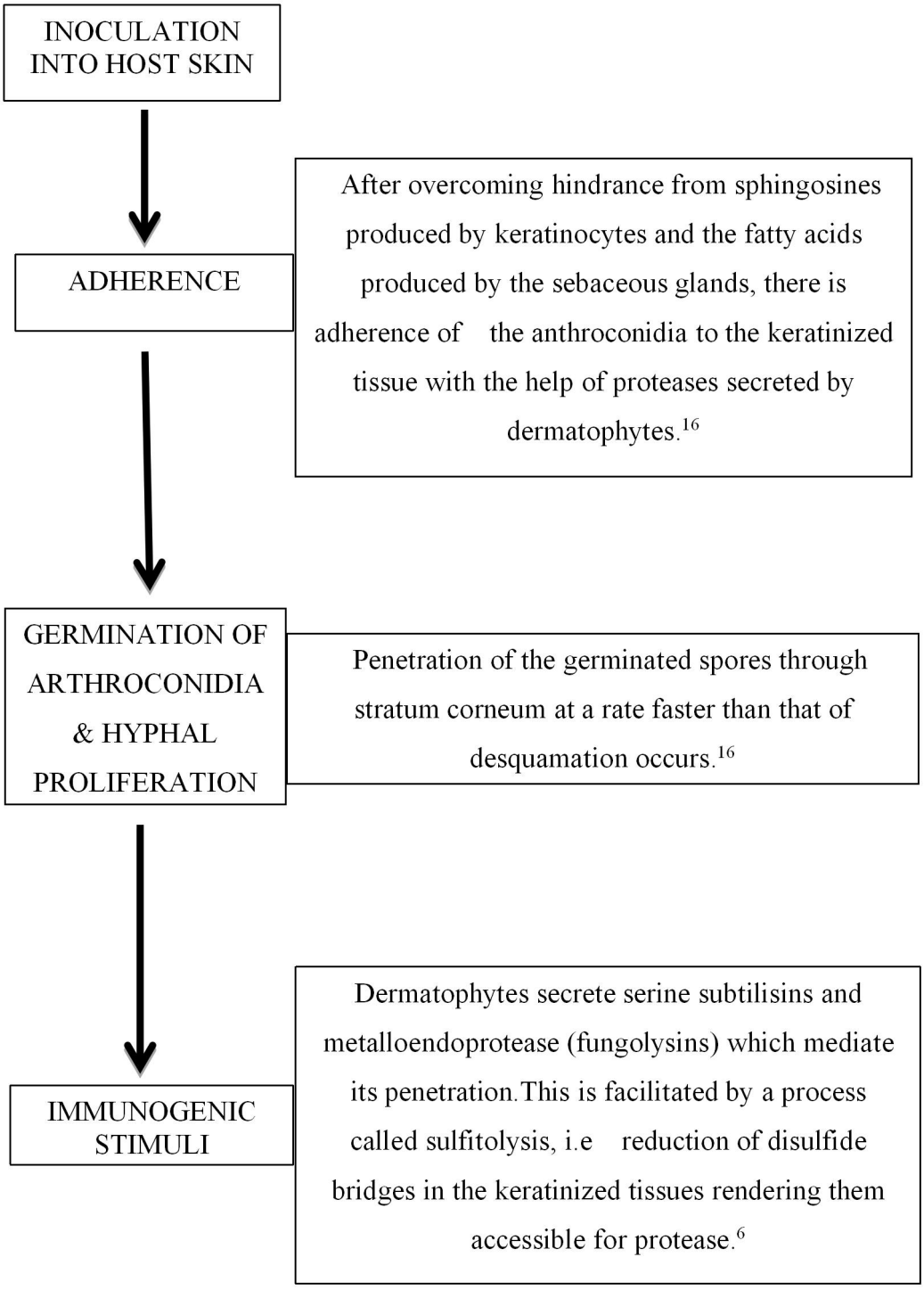
Evidence show that the appearance of infection in familial or genetically predisposed individuals is mediated through specific defects in innate and adaptive immunity. Jaradat *et al*, attributes low defensin beta 4 in patients, as a possible predisposing factor for all dermatophytes.[10,18] Susceptibility to develop dermatophytic infection depends upon the site of involvement. Growth of the fungus in intertriginous areas (web spaces and groins) occurs as a consequence of excess sweating, maceration, and alkaline pH.[10]

Environmental Factors: [7]

Dermatophytes are abundant in different ecological niches, with three main sources of infection. Among them humans, being the most common source, followed by animals, and soil.[7] Humans get infected from dermatophytes from all three sources directly or indirectly, causing the manifestation of dermatophytoses in different clinical entities.[7]

At first, dermatophytes contaminate the patient's environment and subsequently, the transmission of dermatophytosis occurs almost exclusively through indirect contact, thereby facilitating the spread of infection to others. Low socioeconomic status, sharing of clothes and footwear, overcrowding, hot and humid climate, poor hygiene and sanitary conditions, and migration of population are also some predisposing environmental factors in Indian scenario accounting for increasing chronic and recurrent forms of dermatophytosis.[7]

Pathogenesis



Host Immunity

Innate Immunity

The Innate immune mechanism helps in recognizing carbohydrate molecules (β-glucan) such as dectin-1 and dectin-2, that are present in dermatophyte cell wall, which activates toll-like receptor 2 and 4 (TLR-2 and TLR-4). This is followed by amplified production of tumor necrosis factor-α and IL-17, IL-6, and IL-10, via dectin-1, all of which lead to stimulation of adaptive immunity. In the presence of dermatophyte antigen such as trichophytin, keratinocytes release IL-8 which is a potent neutrophilic chemo-attractant. [10]

Adaptive Immunity

Fungal metabolic products diffuse through the malpighian layer to cause redness, vesicle, or even pustule formation along with pruritus. There is a restriction of their *in vivo* activity to the zone of differentiation, newly differentiated keratin and Adamson's fringe within the hair shaft.[16]

- **Humoral Immunity**

Chronic infection occurs as a result of high immediate hypersensitivity response and low delayed-type hypersensitivity(DTH) response.[15] It is also associated with high levels of IgG4 and IgE antibodies and the production of Th2 cytokines[11]. IL-4 produced Th 2 cell induced antibody isotype switching occurs.[10]

- **Cell-Mediated Immunity**

An acute inflammatory response correlates with a positive DTH skin test to trichophytin and consequent activation of Th1/Th17 dependent cell-mediated immunity (CMI) that determines the dermatophytic clearance from the skin.[20] The atypical, chronic, or unusual clinical forms may be attributed to immune dysregulation with skewed immune response toward Th2 cytokines with high levels of IgE and IgG4 antibodies.[7]

However, the immune response varies according to the dermatophyte species, the host species, and the pathophysiological status of the host.

Host factors limiting the infection include:

- Serum inhibitory factors like ferritin, beta-globulins, and other metal chelators that bind to iron, essential for growth of dermatophytes.[21,22]
- Serum α2 macroglobulin, a keratin inhibitor that modifies the growth of the dermatophytes.[21,22]
- Unsaturated transferrin in the serum binds to the fungal hyphae thereby inhibiting its growth.[21,22]
- Presence of post-pubertal, fungistatic and fungicidal long-chain saturated fatty acids may be the cause for the natural resistance of scalp to tinea capitis in adults .[23]
- Commensal *Pityrosporum* yeast aided lipolysis and increased pool of fatty acids. [24,10]

In general, intense inflammatory infections can be attributed to zoophilic species, which may heal spontaneously and are partly resistant to re-infection. Usually, more chronic, less circumscribed lesions, are caused by anthropophilic species which are less resistant to re-infection.

Clinical features

Dermatophytosis can be traditionally classified into different types based on the site of infection:

Dermatophytosis	**Anatomical site of involvement**
Tinea corporis	Neck, trunk and limbs
Tinea cruris	Groin, perineal and perianal area
Tinea barbae	Beard and mustache
Tinea capitis	Scalp
Tinea faciei	Non-bearded region of face
Tinea pedis	Soles and between toes
Tinea manuum	Palms and interdigital folds of the hands.
Tinea unguium	Nails

Table 4: Classification based on anatomical site of involvement

Tinea Corporis:

Synonyms: Tinea circinata, Tinea glabrosa

The occurrence of dermatophytosis on the trunk, neck, arms, or legs is termed tinea corporis.[26] It can be caused by any dermatophyte. However, the most common pathogen worldwide is *T. rubrum*, followed by *T. mentagrophytes* [25] and zoophilic dermatophytes such as *Microsporum canis*.[26] An incubation period of about 1 to 3 weeks is typical[25] Exposed skin are the usual sites of infection.[11] A typical lesion of tinea corporis is characterized by an annular or polycyclic pattern with a clear center surrounded by an erythematous and vesicular or scaly border. [25] Defective cellular immune responses often modify this clinical pattern. It can have a variable degree of inflammation and roughly proportional to the extent of follicular invasion; hence, tinea capitis or tinea barbae are comparatively more inflammatory than tinea corporis.[26]

Clinical variants include tinea profunda, tinea imbricata, bullous tinea corporis, psoriasiform, lichenified plaques, eczematous type, Majocchi's granuloma, vasculitis like lesions, and erythema induratum like plaques.[27]

Tinea Profunda

An excessive inflammatory response to dermatophyte results in the formation of tinea profunda (analogous to a kerion on the scalp). It may have a granulomatous or verrucous appearance. Easily mistaken for cutaneous tuberculosis, a dimorphic fungal infection or squamous cell carcinoma.[25]

Tinea Imbricata(Tokelau)

Chronic superficial dermatophytytic infection caused by the anthropophilic dermatophyte *T.concentricum* is termed as tinea imbricata.[25] Usually geographically restricted to the equatorial band encompassing the South Pacific, Asia, and Central and South America. It is a morphologically distinct entity with concentric annular rings resembling erythema gyratum repens as its characteristic clinical presentation.[25]

It is postulated that the development of this fungal infection occurs under the influence of genetic, environmental, and immunologic factors. Majority of the patients have autosomal recessive mode of inheritance with a minority having an autosomal dominant pattern. There is a decrease in the cellular immunity suggested by the presence of specific antibodies to *T.concentricum*, it is also found to be associated with iron deficiency, dietary influences, and malnutrition. Diagnosis is primarily clinical and isolation on culture. It is a highly recurrent condition. Currently, the best therapeutic option is terbinafine at a dose of 250 mg/day in adults.[10]

Majocchi's Granuloma

A deep dermatophytic folliculitis with disruption of the follicular wall is termed as Majocchi's granuloma.[10] An extensive or even vegetating lesion can occur in the setting of immunosuppression.[25] It occurs as a consequence of progressive dissemination of a long-standing superficial fungal infection into the subcutaneous tissue. Most frequently caused by *T. rubrum.* Penetration of fungi into the reticular dermis is facilitated by trauma-induced mechanical damage to the skin, resulting in cellular destruction and decreased dermal pH that makes the milieu more suitable for its survival.[10]

Immunocompromised hosts are easily susceptible. Immunosuppression due to topical steroid application can result in development of Majocchi's granuloma. Treatment option include systemic antifungals such as terbinafine at a dose of 250 mg/day for 4–6 weeks, itraconazole 200 mg twice daily for 1 week/month for 2 months.[10]

Tinea Cruris:

Synonyms: 'Dhobi's itch', jock itch, gym itch, eczema marginatum

The inguinal region dermatophytoses, in particular, the inner aspects of the upper thighs and crural folds is called tinea cruris. [25] Fungal growth is encouraged by warm and moist environment in the groin area. It is more commonly seen in males. *T. rubrum, T.mentagrophytes* and *E. floccosum* being the most common causative dermatophytes.[25]

Tinea Barbae:

Dermatophytosis of the beard and mustache areas of the face is termed tinea barbae. It is associated with invasion of coarse hair.[26] It is also known as tinea sycosis and barber's itch. It is a disease of adult males.[26] Most commonly caused by *T. rubrum* among the anthropophilic species while *T. verrucosum* among the zoophilic species.[17]

Types of tinea barbae are as follows:

1. *Inflammatory type:* Characterized by nodular and boggy lesions like a kerion and seropurulent discharge and crusting is often seen associated with the lesion. They are commonly seen on the chin, neck maxillary and submaxillary areas. Sinus tract formation may occur in chronic lesions. Scarring and permanent alopecia can occur as a result of spontaneous resolution.[17]

2. *The superficial or sycosiform type: A*nthropophilic species are the most common causative agents of this subtype. It manifests as diffuse erythema with perifollicular papules and pustules. It resembles bacterial folliculitis.[17]

3. *Circinate or spreading type:* At the periphery, *v*esiculopustular lesions are seen and there may be central scaling. Relative sparing of hair may be appreciated.[17]

Tinea Capitis:

The dermatophytic infection of the scalp is termed as tinea capitis. There is essentially an invasion of the hair shafts by dermatophyte fungus.[26] It is particularly observed in children. A distinct predilection for the hair shaft is seen with *T. tonsurans, T. schoenleinii* and *T. violaceum* and *E. floccosum* , while *T.concentricum* and *T. interdigitale* are exceptional in apparently never causing tinea capitis.[26]

Classification of tinea capitis: [17]

According to the size and the location of the spore

- Ectothrix (spores outside the hair shaft)
- Endothrix (spores inside the hair shaft)

According to the inflammatory component of the clinical presentation

- Inflammatory (kerion and favus)
- Non-inflammatory (grey patch and black dot types)

Category	Description	Most common causative agent
Ectothrix	• Dull and Grey Hair • Wood's lamp examination shows bright green fluorescence. • Arthroconidia is present outside the hair shaft	• Fluorescent small spore ectothrix- *Microsporum audouinii*, *M. canis M. gypseum, M. distortum,* and *M. ferrugineum* • Non-fluorescent large spore ectothrix- *T. mentagrophytes*, *T. equinum*, *T. megninii* and rarely *T.rubrum*
Endothrix	• Patches of alopecia with black dots of broken hairs occur as a result of hair breakage at the follicular orifice. • No fluorescence under Wood's lamp. • Shortened hair stubs are filled with arthoconidia .	• *T. tonsurans* and T. *violaceum*
Gray patch	• Circular patches of partial hair loss	• *M.audouinii*

	• Dull gray lusterless broken hair • Arthrospores covering the hair	
Black dot	• The hair shaft is extremely brittle and broken at the level of the scalp. • On clinical examination, the remnants of the hairs left behind in infected follicles, give the appearance of black dots.	• *T. tonsurans* and T. *violaceum*
Kerion	• Inflamed swelling being boggy, indurated and tender seen to be studded with broken or unbroken hairs, vesicles, and pustules.	_*T. verrucosum* and *T. mentagrophytes*
Favus	• Characterized by yellow cup-shaped crust composed of a dense mat of mycelia and epithelial debris. This is called as scutulum due to its shield like shape	*T. schoenleinii, T. violaceum, M. gypseum*

Table 5: Classification of tinea capitis [17]

Tinea Faciei:

Tinea faciei is dermatophytoses of the glabrous skin of the face (the mustache and beard areas of the adult male are excluded). Tinea faciei is commonly caused by *T. mentagrophytes* and *T. rubrum* and occasionally, due to *M. audouinii* and *M. canis*.[26] Erythema is usually seen, but scaling is present in less than two-thirds of cases.[26]

Tinea Pedis:

Synonyms: ringworm of the foot, athelet's foot

Dermatophytic infection of the feet or toes is termed tinea pedis. It is also called "athlete's foot." It is more commonly seen among adults than children. *T. rubrum, T. mentagrophytes* and *E. floccosum* are the commonest causative organisms of tinea pedis.[17]

It is of the following types:

- *Chronic intertriginous type:* It is characterized by fissuring, scaling or maceration in the interdigital or subdigital areas. It is the commonest type of tinea pedis.[17]
- *Chronic papulosquamous type:* Characterised by patchy or diffuse moccasin-like scaling over the soles associated with inflammation.[17]
- *Vesicular or vesiculobullous type:* Usually caused by *T.mentagrophytes* var. *interdigitale.* Occasionally, *E. floccosum* infection can also show similar presentation. Clinically, the instep and the mid-anterior plantar surface are studded by *s*mall vesicles or vesiculopustules.[17]
- A*cute ulcerative variant:* commonly associated with maceration, weeping, denudation, and ulceration of sizable areas of the soles [17]

Tinea Manuum:

Tinea manuum is a dermatophytic infection of the palm or interdigital folds of one or both hands. It frequently coexists with tinea pedis, but rarely, localized forms may solely affect the hands.[26] *T. rubrum* and *E. floccosum* are the dermatophytes responsible for tines manuum. .[26]

Two main clinical types have been described:

1. *Non-inflammatory squamous form:* Clinically presents with palms and fingers showing diffuse hyperkeratosis, with accentuation of the flexural creases being characteristic. It is commonly associated with Hyperhidrosis.[17]

2. *Inflammatory vesicular/dyshydrotic/eczematous form:* Vesicles, usually in clusters and frequently multiloculated are present over the palms. The lesion is arranged in an annular or segmental pattern. *T.mentagrophytes* is commonly isolated organism.[17]

Tinea Ungium:

The term onychomycosis is derived from the Greek word onyx (nail) and mykes (fungus). Dermatophytic infection of the nail plate is termed tinea ungium. All infections of the nail caused by any fungus including non-dermatophytes and yeasts is considered under the term onychomycosis.[17]

Majority of the patients show the presence of associated tinea pedis or tinea manuum, while nail infections may be the only manifestation of fungal disease in a few patients. Most of the fungal nail infections are particularly seen in adults. Protection among children may be due to faster nail growth in them.[17]

Dermatophytes most commonly causing tinea unguium are, *Trichophyton rubrum, T. mentagrophytes* var.*interdigitale,* and *Epidermophyton floccosum*. Nail infection can be caused by many non- dermatophytes.[17]

Onychomycosis has been divided into four clinical types:

- Distal and lateral subungual onychomycosis (DLSO)
- Proximal subungual onychomycosis (PSO)
- White superficial onychomycosis(WSO)
- Endonyx onychomycosis(EO)
- Total dystrophic onychomycosis (TDO)

The most frequent form being distal and lateral subungual onychomycosis, commonly caused by *T.rubrum*. It presents as distal and lateral nail discolouration and onycholysis with subungual hyperkeratosis. Proximal subungual type, is characterized by the spread of the infection from the cuticle towards the nail tip. Frequently seen in AIDS patients. Superficial white onychomycosis presents with nail surface having white patches or pits. The most common causative agent being *T. interdigitale*. [23]

The melanized molds *Neocytalidium dimidiatum* primarily causes black superficial onychomycosis. *T. soudanense* and *T.violaceum* are attributed as the causative agents of

Endonyx .Nail plate crumbles and disappears leaving behind hypertrophied nail bed in case of total dystrophic onychomycosis .[23]

Tinea Incognito:

Modification of tinea as a result of topical or systemic immunosuppressants due to misdiagnosis or given for some co-existing dermatosis is known as tinea incognito. Corticosteroids being the commonest causative agent. Recently, topical calcineurin inhibitor-induced tinea incognito has also been reported.[4]

Minor alterations in the presentation is induced by systemic steroids whereas topical steroid application leads to profound change in the character of the lesion.[4] Both of which result in difficulty in diagnosis and administration of the wrong treatment.[4]

Chronic Dermatophytosis

Synonyms: Tinea corporis generalisata, tinea rubrum syndrome, dry-type tinea rubrum infection and generalized chronically persistent rubrophytia.

It is persistent dermatophytosis running a chronic course with episodes of remission and exacerbation.[10] It is characterized by the involvement of at least four body sites such as feet (plantar), hands usually palms, nails, along with one more site other than inguinal area and with microscopy and culture showing the presence of *T. rubrum.*[10]

Tinea Indecisiva/ Tinea Pseudo Imbricata:

Alternating use of antifungals with topical steroids for a prolonged period of time may produce a clinical picture similar to tinea imbricata but is caused by dermatophytes other than *Trichophyton concentricum*. [28] Characterized by widespread annular concentric erythematous rings produced as a result of cyclical immunosuppression due to topical corticosteroids followed by reinfection due to early discontinuation of topical antifungals.[28,29]

Two Feet, One Hand Syndrome

"Two feet-one hand syndrome" is a form of tinea pedis where not only both feet are infected, but also the skin of one hand and in many cases also the toenails and/or fingernails. *Trichophyton rubrum* and occasionally *Trichophyton mentagrophytes* are the usual causative organisms[30]. Clinically it presents as chronic bilateral, papulosquamous lesion with minimal inflammation and patchy or diffuse mocassin-like scaling over the soles. In "two feet-one hand syndrome" the development of tinea pedis generally precedes the development of tinea manuum. [30,31]

Laboratory investigations

The diagnosis of dermatophytosis is mainly clinical but when the morphology is altered laboratory investigations are done to prove the etiology. The laboratory investigations include

- Wood's lamp
- Potassium Hydroxide(KOH) wet mount for direct microscopy
- Dermoscopy
- Histopathological examination
- Fungal culture

Newer methods include:

- Polymerase chain reaction (PCR)
- Matrix-assisted laser desorption ionization-time of flight (MALDI-TOF) mass spectrometry
- Reflectance confocal microscopy

1. Wood's Lamp Examination

Wood's lamp emits long-wave ultraviolet light and can be used to detect some dermatophytes in skin and hair due to pteridine induced fluorescence.[32]

Uses of Wood's lamp in dermatophytosis

- It helps in the diagnosis of inconspicuous scalp lesions.[32]

- Apart from the diagnostic utility, Wood's lamp helps in the selection of infected skin and hairs for laboratory investigation.[32]
- Dermatophytoses can be differentiated from other clinically similar-looking non-fungal skin conditions. e.g., erythrasma.[33]

Fluorescence causing dermatophytes are generally members of the *Microsporum* genus.[33]

Tinea capitis: Blue-green (most *Microsporum* species), occasionally dull yellow (*Microsporum gypseum*) and dull blue (*Trichophyton schoenleinii*).[33]

2. Direct microscopic examination

Direct microscopic examination helps in the rapid determination of fungal etiology. It is a simple screening technique done by examining the clinical specimen using microscope thereby allowing the clinician to initiate antifungal therapy for dermatophytosis. It is done by microscopic examination of the affected skin, nail or hair specimen in 10% KOH that accelerates desiccation of the protein and disrupts the keratin aiding in visualization of fungal elements. [35]

Other alternatives to KOH are detergents such as:[28]

- Sodium hydroxide (NaOH)
- 10% Sodium sulphide solution(warming of the specimen not necessary)
- Amann's chloral lactophenol
- 35% Dimethylsulphoxide
- Sodium dodecyl sulfate (SDS)
- Dimethylacetamide
- Dimethylformamide

The usage of fluorescent fungal cell wall dyes enhances microscopic examination. Dyes such as cotton blue C4B (Bacti-Lab Inc., RAL or Bio-Rad, associated with lactic acid and phenol) or blue–black ink permanent (Parker Quink), or Chlorazol Black E (CBE) stain which impart deep blue or black color to fungal element are used. [35]

Procedure:[26]

Skin scrapings /nail clipping/hair roots are placed over a glass slide

↓

1 or 2 drops of KOH/NaOH is added

↓

Coverslip is placed on top

↓

Preparation gently heated by passing slide over bunsen burner 3-4 times

↓

The slide is placed at room temperature for a few minutes

↓

Observed under microscope

All preparations are first observed under low power and confirmed under high power.

The following can be noticed in the microscopic examination of skin or nail infected by dermatophytes :

- Hyaline hyphal fragments
- Septat , branched hyphae
- Chains of arthroconidia

Microscopic examination of infected hair shows:

- Ectothrix: arthroconidial colonization in the form of mosaic sheath around hair or chains on the surface of hair shaft.[27]
- Endothrix: chains of arthroconidia filling the insides of shortened hair stubs.[27]

3. Dermoscopy:

Dermoscopic findings noted in cases of tinea corporis include follicular micropustules, diffuse erythema, and brown spots surrounded by a white-yellowish halo, wavy hair, broken hair,

and at times morse code hair. Studies on dermoscopy of tinea capitis have depicted comma hairs, zigzag hairs, corkscrew hairs and morse code hairs. Proximal jagged edge, longitudinal striations and spikes, are observed in the cases of onychomycosis.[38,41]

Zigzag hair is suggested to represent structural weakness where the hair cuticle is perforated by the fungus *M. canis* followed by the production of conidia on the hair surface and the paler part of the infected hairs bends .[39] Cracking and bending of hyphae-filled hair shafts are hypothesized to cause comma hair.[39]

Recently, a new trichoscopic feature, morse code like-hairs (bar code-like hairs) has been described. Localized areas of fungal infection appear as empty bands, multiple such horizontal white bands are present which causes the hair to bend and break.[40] It denotes fungus infected hair follicle.[41]

4. Histological examination:

There is restriction of dermatophytosis to the stratum corneum of the skin, nails, and hair. In the epidermis, a toxic reaction resembling an acute, subacute, or chronic dermatitis is the initial response to the fungus. Hyperkeratosis and parakeratosis are seen in the dry scaly plaque of chronic tinea corporis. Fungal hyphae if present, may be sandwiched in the horny layer between two zones of cornified cells which is known as ‘sandwich sign’.

Confirmation of hyphae in the stratum corneum can be done by special stains such as Grocott-Gomori’s Methenamine Silver (GMS) or Periodic Acid Schiff (PAS) stain. It may be used in the diagnosis of Majocchi's granuloma in which KOH examination of scale on the surface may more often be negative.[10] At times discrete fungal grains appearing as yellowish white pseudo-granules enveloped in an eosinophilic matrix of Splendore-Hoeppli material may be seen.[42] A highly sensitive method for the diagnosis of onychomycosis include nail biopsy specimens stained with PAS[43]

5. Culture

The gold standard method of diagnosis of dermatophytosis is isolation and identification of dermatophytes from the clinical samples. Culture is usually done for academic purposes. Dermatophytes can be cultivated in an artificial media containing an organic source of nitrogen.[36] Commonly used media are as follows:[36]

i) Sabouraud's dextrose Agar (SDA)

SDA medium is the most commonly used medium which contains :

- Peptone 1%
- Dextrose 4%
- Agar 2%
- PH 5.6
- Chloramphenicol 0.05 g/L
- Cycloheximide 0.5 g/L

ii) Emmon's modified SDA

It contains:[36]

- 2% Dextrose instead of 4%
- Neopeptone instead of peptone
- PH: 6.8-7

Chloramphenicol prevents bacterial contamination while cycloheximide inhibits the growth of non dermotophytic molds. Cycloheximide free medium should be used for isolation of non-dermatophytic mold infections in palms, soles and nails.

iii) Potato flake agar:

It promotes rapid conidiation and colony pigment development [27]

iv) Dermatophyte test media(DTM):

DTM helps in screening heavily contaminated material to detect the presence of dermatophytes.[27] Dermatophyte test medium was developed by Taplin as a selective and

differential medium for detection and identification of dermatophytes. Presumptive identification of growth of dermatophytes on this media can be done based on gross morphology and the production of alkaline metabolites, which raise the pH and cause the phenol red indicator to change the color of the medium from yellow to pink-red.[35]

Procedure :

Skin/nail scrapings or hairs collected

↓

Plated on selected isolation media

↓

Incubated at 20-25°C for 4-6 weeks

(higher incubation temperatures of 30°C–32°C may be required if *Trichophyton verrucosum* is suspected)

↓

Macro and microscopic identification of species

Dermatophytes may be identified in culture in the following sequence of procedure[37]

- The colony is to be examined for colour of the surface and the reverse plane, texture, and growth rate.
- Teased mount in lactophenol cotton blue is examined under a microscope. The arrangement of microconidia and macroconidia is noted.
- If the above step is inconclusive, slide culture is prepared and examined for characteristic morphology. Special medium for sporulation may be considered.
- The following physiological tests may be performed if necessary:
    a. Urease test
    b. *In vitro* hair perforation
    c. Growth on rice grains if a *Microsporum sp.* is suspected
    d. Nutritional requirement if a *Trichophyton sp*. is suspected

Dermatophyte species	Growth	Macromorphology	Micromorphology
Epidermophyton floccosum	Moderately rapid	Flat, initially slightly granular, later white puffs of degeneration develop; sandy to olive-brown. Reverse plane is yellowish	Prolific macroconidia, club-shaped with broadly rounded apex, absent microconidia; many chlamydospores in primary isolates
Microsporum audouinii	Moderately rapid	Flat to velvety colony, thin, reverse is pale salmon to pale brownish	Deformed macroconidia, with beak or constricted mid-region. Drop-shaped microconidia, pectinate branching, apiculate terminal chlamydospores seen
M.canis	Rapid	Flat to velvety, thin, pale to yellow, reverse is yellow	Thick-walled roughened and beaked macroconidia. Drop shaped microconidia.
T.rubrum	Moderately slow	Cottony creamy to white surface with yellow marginal	Rare macroconidia, drop-shaped microconidia; coiled

		zone. Reverse is intense yellow.	yellow "nodular bodies" and yellow pigment present in the submerged mycelium.
T.mentagrophytes complex	Rapid	Granular to powdery, yellow cream to buff surface, pale to red brown reverse.	Uncommon macroconidia, club shaped smooth; microconidia abundant nearly spherical; spiral appendages present.
T.verrucosum	Slow	Convoluted, slightly velvety whitish colony	Macroconidia are seldom seen, with "rat tail" extension; microconidia round to drop shaped.

Table 6: Important characteristics of clinically isolated dermatophytes[26,17]

The following physiological tests may be performed if necessary, to differentiate different species and genus of dermatophytes:

- **Hair Perforation Test**

Sterile human hair is suspended in yeast extract supplemented distilled water. The hair is inoculated with the test organism. It is incubated at 26 degrees Celsius for 2 weeks, following which the hair is mounted to look for wedge-shaped penetrations perpendicular to the hair axis.[26] It is utilized to differentiate *T.mentagrophyte from T.rubrum* as well as *M.canis from M.equinum*. The test is positive in *T.mentagrophytes* and *M.canis* and negative in T.*rubrum* and *M.equinum*.[36]

- **Urease Test**

Filter sterilized urea agar base is mixed with sterile molten agar and allowed to set. The medium is then inoculated with the test organism. After incubation for 7 days at 26 degree Celsius, *T.mentagrophytes* hydrolase urea which is indicated by a change of the colour from yellow to magenta red, while *T.rubrum* shows negative results.[26]

- **Growth On Rice Grains**

Autoclaving of distilled water coated white rice followed by inoculation of test organisms onto the surface is done and the growth is assessed after incubation at 26 degrees Celcius for 2-3 weeks.[38] This test is used to differentiate *M. audouinii* which shows poor growth from other *Microsporum* species which show good growth.[26]

Newer diagnostic methods

The clinical microbiological laboratory employs rapid and specific Nucleic acid-based molecular methods for the identification of the fungi as well as for the detection of the etiological agents directly from the clinical specimen.

Phenol–chloroform method or commercially available DNA extraction kit can be used for the extraction of DNA from the clinical specimens. Either conventional polymerase chain reaction (PCR) or real-time PCR molecular diagnoses are utilized for the rapid detection of etiological agent from the clinical specimens.[35] PCR-ELISA, a post-PCR technique has been reported to be highly sensitive for detection of dermatophytes to the species level from the clinical specimens.

A relatively new technique that is being used in the microbiology laboratory for the rapid identification of the microorganisms is Matrix-assisted laser desorption ionization-time of flight (MALDI-TOF) mass spectrometry.[35]

Reflectance confocal microscopy is an noninvasive procedure that provides *in vivo* imaging of the epidermis and superficial dermis at cellular level resolution and can be use to detect

cutaneous fungi and parasitic infestations. Branching fungal hyphae can be detected over an erythematous annular scaly patch.[10]

Treatment of dermatophytosis

Dermatophytic infection has a straightforward treatment as it is a common occurrence of the skin and its appendages but lately, it has become notably challenging due to chronicity and recurrence. Treatment options available are monotherapy, combination therapy, or sequential therapy.[4]

General measures[43]

- Clothing should be loose-fitting, of cotton or synthetic material that removes moisture away from the skin surface.
- Sharing garments and towels must be discouraged.
- Undergarments, socks, and caps should be regularly washed and dried in the sun and ironed.
- Frequent changing of clothes should be advised
- Use of absorbent powders and deodorants (decrease perspiration) can be encouraged
- Weight reduction in obese patients must be advised
- Simultaneous treatment of other affected family members should be done.
- Avoidance of occlusive footwear is advised

Topical Therapy[43]

Topical antifungals are usually used along with systemic antifungals as a combination therapy. Indications for using only topical antifungal agents (AFAs) are as follows

- Localized lesions
- Pregnancy in the first trimester
- Hepatic failure/ any severe systemic illness where systemic antifungals are contraindicated.

Options for topical therapy include azole antifungals including triazoles and allylamines, imidazoles, tolnaftate, benzylamines, ciclopiroxolamine and whitfield ointment. The topical

antifungals should be applied 2 cm beyond the margin of the lesion for at least 2 weeks beyond clinical resolution- **RULE OF TWO**

Systemic Therapy[43]

Indications for using systemic therapy in the management of dermatophytosis are

- Multiple sites of involvement
- Extensive tinea corporis
- Recurrent or chronic dermatophytosis
- Tinea pedis, Tinea capitis, Tinea unguium,
- Localized infection unresponsive to topical AFAs,
- Immunocompromised states.

Systemic treatment options available against dermatophytes are itraconazole, terbinafine griseofulvin, , ketoconazole and fluconazole. Ketoconazole is not routinely used due to hepatotoxicity

	Tinea corporis	**Tinea capitis**	**Onycomycosis**
Topical therapy	**Adults and Children:** Azoles for 2 to 4 weeks	**Adults and Children:** 2% ketoconazole	**Adults and Children:** Ciclopirox 8% OD, Amorolfine 5% once/week
Systemic therapy A.first line	**Adults:** First choice Terbinafine 250 mg/day for 2 to 3 weeks Second choice	**Adults:** Terbinafine 250 mg daily for 2-4 weeks (in case of *Trichophyton*	**Adults:** First choice: Terbinafine 250 mg/day (6 weeks for fingernails; 12 weeks for toenails; consider

	Itraconazole 200 mg/day for 1-4 weeks **Children:** First choice: Terbinafine For 2-4 weeks - 62.5 mg/day for weight <20 kg - 125 mg/day for weight 20-40 kg - 250 mg/day for weight >40 kg) or 3-6 mg/kg/day Second choice Itraconazole 5 mg/kg/day for 1 to 2 weeks	species) **Children:** Griseofulvin - higher efficacy against *Microsporum* species Dosage: Weight <50 kg: 15-20 mg/kg/day for 6 to 8 weeks Weight >50 kgs: 1g/day for 6 to 8 weeks Terbinafine - higher efficacy against *Trichophyton* species Dosage: Weight <20 kg: 62.5 mg/day for 2 to 4 weeks Weight 20-40 kg: 125 mg/day for 2 to 4 weeks Weight >40 kg: 250	4 weeks extension of treatment in case of inadequate response) Second choice: Itraconazole 200 mg BD for 1 week every month (2 cycles for fingernails; 3 for toenails; one extra cycle may be considered in case of inadequate response) **Children:** First choice: Terbinafine (daily continuous) 62.5 mg/day for weight <20 kg - 125 mg/day for weight 20-40 kg - 250 mg/day for weight >40 kg) or 3-6 mg/kg/day 6 weeks for fingernail and 12 weeks for toe nail onychomycosis

		mg/day for 2 to 4 weeks	Second choice: Itraconazole Pulse therapy (5 mg/kg/day for one week every month) 2 pulses for fingernail and 3 pulses for toenail onychomycosis or 5 mg/kg/day for 2 to 3 months
B.Second line	**Adults:** Griseofulvin 500-1000 mg/day for 2 to 4 weeks Fluconazole 150-300 mg/week for 2 to 6 weeks **Children:** Griseofulvin >1 month of age: 10-20 mg/kg/day for 2 to 4 weeks	**Adults:** Itraconazole or Griseofulvin **Children:** Itraconazole effective against both *Trichophyton* and *Microsporum* species Dose: 50-100 mg/day for 4 weeks or 5 mg/kg/day for 2 to 4 weeks	**Adults:** Fluconazole 450 mg/week for 6 weeks in fingernails and 12 weeks in toenail onychomycosis Griseofulvin 500-1000 mg/day for 6-9 months in fingernail and 12-18 months in toenail onychomycosis **Children:** Fluconazole 3-6 mg/kg once weekly for 12-16 weeks for fingernail infection and

			18-26 weeks for toenail onychomycosis Griseofulvin Above 1 month of age: 10 mg/kg/day for 6-9 months in fingernail and 12-18 months in toenail onychomycosis

Table 7: Treatment of dermatophytosis [4]

Newer therapies

An antifungal is considered effective if its capable of acting against a wide range of fungi as well as have nil to low toxicity to the host. Properties of newer antifungal drugs are as follows:

1. Drugs having similar pharmacology as the older drugs sharing the target molecules, with MIC level being lower (e.g. micafungin, isavuconazole, luliconazole)[44]
2. Repurposing of established medications where an old compound with a known pharmacology is used alone or in combination with another drug for a newer indication, for example, calcineurin inhibitors, the target of rapamycin inhibitors, Hsp90 inhibitors, in synergy with azoles.[44]

The target genes, proteins, or virulence factors required during infection of the host tissues by dermatophytes has been understood better through recent advances in fungal genomics and proteomics, for example, the pH responsive transcription factor PacC, efflux pump inhibitors (derived compounds of milbemycin), a wide-domain regulatory protein involved in pathogenicity events or the sulfite transporters were proposed as interesting targets for antifungal drugs in dermatology because of their role in the proteolytic digestion of hard keratin).[44]

Topical antifungal drug	Mechanism of action
Efinaconazole- Triazole	Used for the treatment of mild-to-moderate distal and lateral subungual onychomycosis. Efinaconazole possesses broad-spectrum antifungal activity against dermatophyte and non-dermatophyte molds and yeasts
Tavaborole- Oxaborole	Highly specific fungal protein synthesis inhibitor resulting in the suppression of fungal cell activity
ME1111- 2-(3, 5-Dimethyl-1H-pyrazol-1-yl) -5-methylphenol	Selectively inhibits fungal succinate dehydrogenase (complex II), an important enzyme involved in mitochondrial respiratory electron transfer leading to the blockade of ATP production and demonstrates fungicidal activity.
Posoconazole- Triazole antifungal agent	Effective in a patient with extensive dermatophytic skin and nail infection with CARD 9 mutation.[46]

Table 8: Newer antifungal drugs:[45]

METHODOLOGY

Source of data

Patients attending the outpatient department of Dermatology, Venereology and Leprosy of B.L.D.E (deemed to be university) Shri. B.M. Patil Medical College, Hospital and Research Centre, Vijayapura, clinically diagnosed with dermatophytoses, were enrolled for the study.

Period of study

The study was conducted during the period of July 2018 to August 2020.

Study design

Hospital based cross-sectional study.

Method of data collection

A total of 384 patients clinically diagnosed with dermatophytoses , irrespective of gender and age, were enrolled for the study. Informed consent was taken from patients of the study.

Inclusion criteria

1. New patients attending or referred to department of dermatology with clinical suspicion of dermatophytosis will be included in the study.
2. Patients of either sex and of all age groups will be enrolled in the study.

Exclusion criteria

1. Follow up patients with clinical diagnosis of dermatophytosis who have either used topical or systemic antifungal agents will be excluded from the study

Method

Detailed history with respect to age, onset and duration of dermatophytoses, presenting complaints, past history of treatment for the same complaints, family history and history of pre-existing medical conditions were noted in scheduled proforma.

Clinical examination of the patient was done to determine the clinical type of dermatophytoses, based on sites of involvement. These findings were recorded in the proforma.

For the purpose of specimen collection, the affected area was swabbed with 70% alcohol. Skin scales, crusts or pieces of nail was collected according to the involved site. Skin specimen is collected by scraping across the erythematous, peripheral, actively growing margins of the lesions and the scales are flaked onto a glass slide using a blunt edge of a sterile surgical blade or a glass slide.

Nail specimen was collected after wiping the toe or finger nail with moist gauze dipped in saline or distilled water (removes dirt and dust) followed by cleaning the discoloured or dystrophic nail plate and nail folds with 70% alcohol (removes coexisting bacteria). Small pieces of nail plate clipping (2 to 3 mm thickness), scrapings of nail bed and sub-ungual debris was collected in a dry paper envelope. In case of hair involvement the dull lusturless hair and stubs of hairs were chosen and plucked by sterile forceps.

Investigations:

1. Potassium Hydroxide (KOH) mount:

Sample collected is placed over a glass slide and 10% KOH is added over the collected material and covered with a cover slip and gently preheated before examining. In case of nail involvement 20% KOH is used. The samples after keratolysis are examined for the presence of filamentous, septate, branched hyphae with or without arthrospores.

2. Fungal Culture:

The samples irrespective of demonstration of fungal elements by direct microscopic examination, are inoculated on test tubes containing

1. Sabouraud dextrose agar without Chloramphenicol and cycloheximide
2. Sabouraud dextrose agar with Chloramphenicol and cycloheximide
3. Dermatophyte Test Media(DTM)

They are incubated at 32°C for a period of 4 weeks. The fungal cultures are identified by colony morphology, pigment production, rate of growth. Lactophenol cotton blue preparations are

made to detect the presence of macroconidia, microconidia, chlamydospore and special hyphal structures.

Statistical analysis

All characteristics were summarized descriptively. For continuous variables, the summary statistics of mean ± standard deviation(SD) were used. For categorical data, the numbers and percentages were used in the data summaries and diagrammatic presentation. Chi-square (χ^2) test was used for association between two categorical variables.

The formula for the chi-square statistic used in the chi square test is:

$$\chi_c^2 = \sum \frac{(O_i - E_i)^2}{E_i}$$

The subscript "c" are the degrees of freedom. "O" is observed value and E is expected value. C= (number of rows-1)* (number of columns-1)

If the p-value was < 0.05, then the results were considered to be statistically significant otherwise it was considered as not statistically significant. Data were analyzed using SPSS software v.23 (IBM Statistics, Chicago, USA) and Microsoft office 2007.

Ethical clearance

Institutional ethical clearance was obtained for the study

RESULTS

A hospital based prospective study was conducted from July 2018 to August 2019 at a tertiary care centre in Vijayapura. A total of 384 patients with clinical diagnosis of dermatophytoses were included in this study.

Age Distribution

Patients of all age groups were included in the study. The age of the patients ranged from 3 to 71 years with a mean age (±SD) of 36.55 (15.03) years. The most commonly affected age group was 30-39 years closely followed by 20-29 years age group with 94 (24.5%) and 92(24%) patients in each group respectively.

Age (Years)	No. of patients	Percentage
< 10	8	2.1
10 - 19	50	13.0
20 - 29	92	24.0
30 - 39	94	24.5
40 - 49	65	16.9
50 - 59	40	10.4
60+	35	9.1
Total	384	100.0

Table 9: Age wise distribution of patients

Sex Distribution

Out of 384 patients enrolled in the study, 260 (67.7%) were males and 124 (32.3%) were females. Male to female ratio was 2.09:1.

Gender	No. of patients	Percentage
Female	124	32.3
Male	260	67.7
Total	384	100.0

Table 10: Gender wise distribution of patients

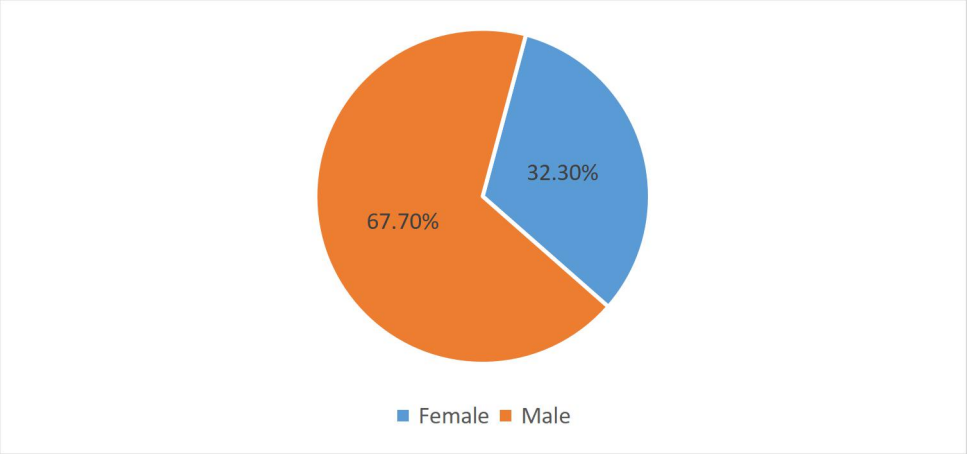


Figure 1: Gender wise distribution

Correlation Between Age And Sex Distribution

Maximum number of affected males belonged to the age group of 30-39 years with 60 males (23.1%) followed by 20-29 years with 59 males (22.7%). Affected females mostly belonged to 30-39 years age group with a total of 34 females (27.4%).

Age (Years)	Gender		Total
	Female	Male	
< 10	2 (25.0%)	6 (75.0%)	8
10 - 19	14(28.0%)	36(72.0%)	50
20 - 29	33(35.9%)	59(64.1%)	92
30 - 39	34(36.2%)	60(63.8%)	94
40 - 49	33(50.8%)	32(49.2%)	65
50 - 59	2(5.0%)	38(95.0%)	40
60+	6(17.1%)	29(82.9%)	35
Total	124(100%)	260(100%)	384(100%)

Table 11: Sex distribution in relation to age

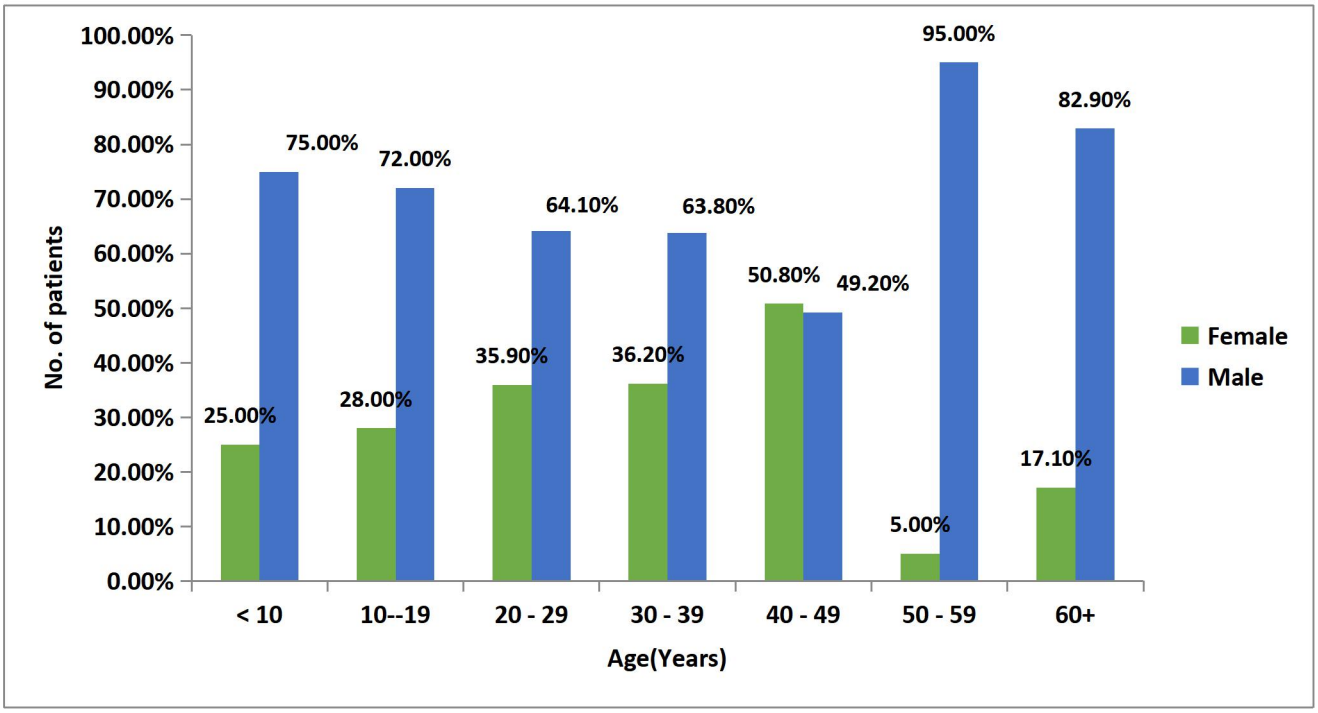


Figure 2: Sex distribution in relation to age

Occupational Status

Farming was the chief occupation in this study group with 117 patients (30.5%), followed by student with 89 patients (23.2%) and 71 patients (18.5%) were homemakers. About 18% of the patients belonged to service providers such as drivers, policemen, teachers, shopkeepers and watchmen. Retired and unemployed group had 7 patients in each group (1.8%).

Occupation	No. of patients	Percentage
Business	24	6.3
Farmer	117	30.5
Homemaker	71	18.5
Unemployed	7	1.8
Retired.	7	1.8
Service	69	18.0
Student	89	23.2
Total	384	100.0

Table 12: Distribution of patients according to Occupation

Socio economic Status(SES)

Major bulk of the patients belonged to lower middle SES with 178 patients (46.4%) which was succeeded by116 patients (30.2%) belonging to upper middle socioeconomic status while 87 patients (22.7%) belonged to upper lower socioeconomic status. Only 3 patients(0.8%) notably belonged to upper class.

Socio economic status	No. of patients	Percentage
Lower	0	0
Upper lower	87	22.7
Lower middle	178	46.4
Upper middle	116	30.2
Upper	3	0.8
Total	384	100.0

Table 13: Distribution of patients based on socio-economic status

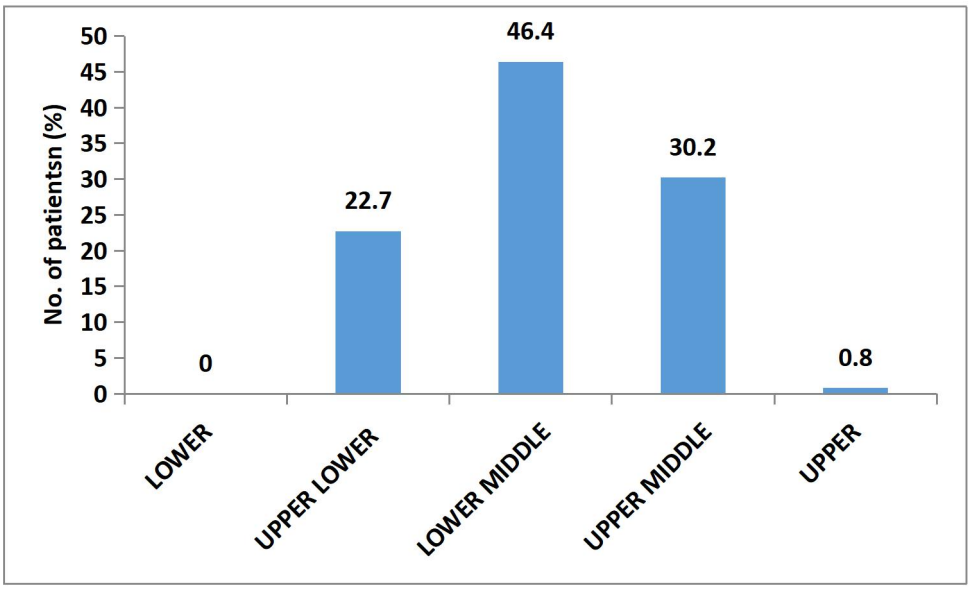


Figure 3: Distribution of patients based on socio-economic status

Duration Of Lesion

The duration of the infection varied from 2 weeks to 1 year. Thirteen patients (3.4%) had infection for less than 1 month while maximum number, 162 patients (42.2%) had history of duration of lesion for 1-3months. Mean duration (SD±) was found to be 3.88 (4.01) months.

Duration of lesion(months)	No. of patients	Percentage
< =1	13	3.4
1- 2	162	42.2
3- 4	104	27.1
5- 6	67	17.4
7- 8	10	2.6
9+	28	7.3
Total	384	100.0

Table 14: Distribution of patients based on duration of lesion

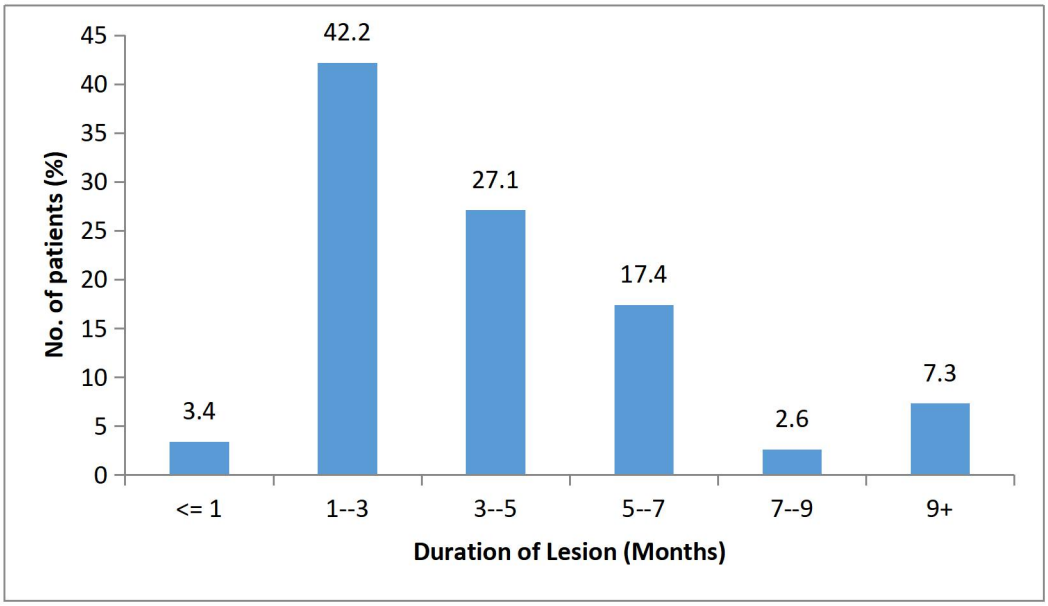


Figure 4: Distribution of patient based on duration of lesion

Past History

1. History of previous medication

History of taking treatment of any form, prior to consultation at the tertiary care centre was observed in 364 patients (94.7%). Among them 212 patients(55.2%) had history of taking oral medications along with application of topical medication while 18 patients(4.7%) had used only oral medication and 8 patients (2.1%) had history of application of topical steroid combination

medication alone. History of either using medications, whose details were not known to the patient or usage native medication was seen in 126 patients (32.9%).

Type of medication	No. of patients	Percentage
Oral + topical	212	55.2
Oral medication	18	4.7
Topical steroid combination medication	8	2.1
Unknown medication	126	32.9
Nil	20	5.2

Table 15: Distribution based on previous medication

2. History of prior consultation

History of self treatment by using medication taken from the pharmacy was elicited in 190 patients (49.5%). Treatment following consultation of a doctor for the skin ailment was seen in 174 patients, among them 148 patients had consulted a general practitioner while 26 patients had consulted a dermatologist.

Consultation	No of patients	Percentage
Dermatologist(D)	26	6.8
General practitioner(GP)	148	38.5
Pharmacist(P)	190	49.5
Nil	20	5.2

Table 16: Distribution based on prior consultation

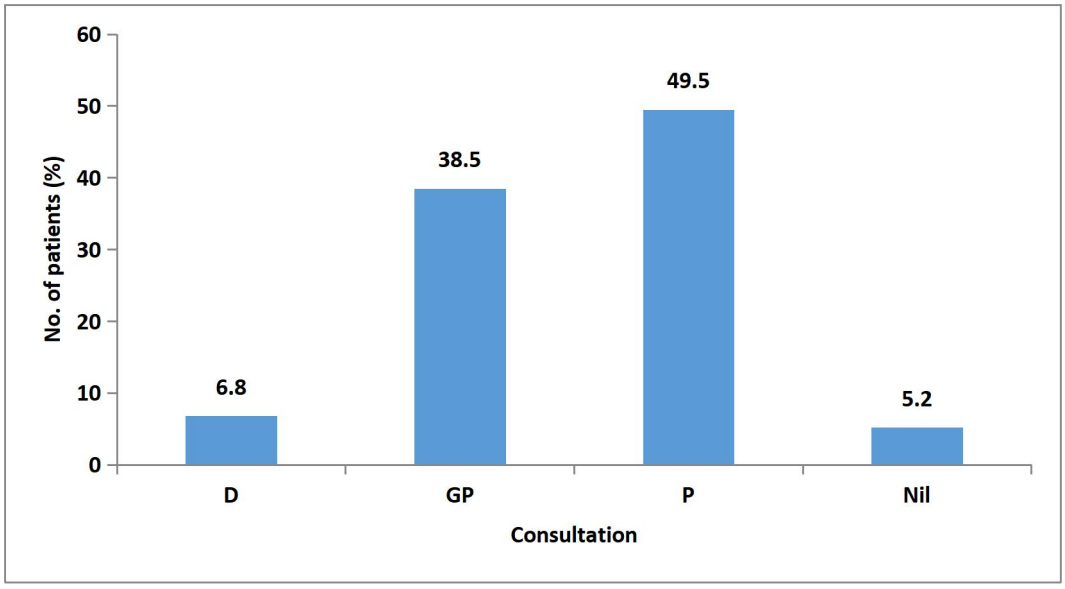


Figure 5: Distribution based on prior consultation

3. Past history of similar complaints

History of similar complaints in the past was seen in 78 patients (20%). Among them 30 patients (38.7%) had similar complaints 1 year back, while it was present 3 and 6 months back in 24 (30.7%) patients each.

Duration of similar complaint	No of patients	Percentage
3m back	24	30.7
6m back	24	30.7
1y ago	30	38.4

Table 17: Distribution based on past history of similar complaints

. **Family History**

Similar complains among family members or close contacts was seen in 143 (37.2%) patients

Family history	**No. of patients**	**Percentage**
Present	143	37.2
Absent	241	62.7
Total	384	100.0

Table 18: Distribution of patients according to Family history

Personal History

1. **Personal hygiene**

Out of 384 patients, 277 (72.1%) patients gave history of taking bath everyday while 95 (24.7%) patients gave history of taking bath on alternate days and 12 (3.1%) patients took bath once in 2 or more days.

Bathing(Days)	No. of patients	Percentage
Every day	277	72.1
Alternate day	95	24.7
>= 2 days	12	3.1

Table 19: Distribution of patients based on bathing history

2. History of tight clothing

Frequently wearing tight garments like leggings, jeans or tying of saree/dothi tightly was seen in 195 patients (50.8%). Tinea lesions were commonly seen to be present in areas prone for occlusion due to tight fitted clothes like the waistline, groin or inframammary area.

H/O Tight clothing	No. of patients	Percentage
Present	195	50.8
Absent	189	49.3

Table 20: Distribution of patients based on history of tight clothing

3. Histroy of sharing fomites

Sharing of clothes, combs, pillows and beds among close contacts or family members was habitual among 137 patients.

H/O Sharing Fomites	No. of patients	Percentage
Present	137	35.7
Absent	247	64.3

Table 21: Distribution of patients based on sharing of fomites

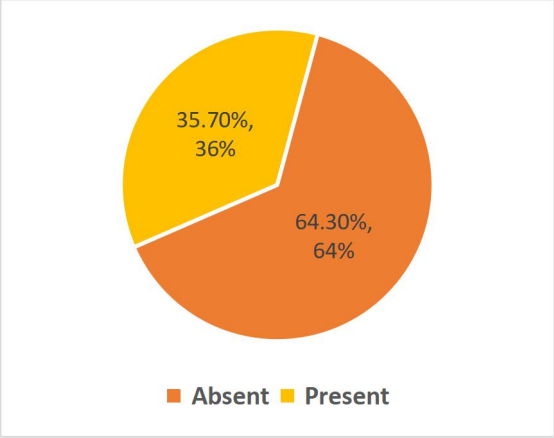


Figure 6: Distribution based on sharing of fomites

4. Pet history

History of contact with animals such as dog/cats was seen to be present in 128 patients (33.3%).

H/O contact with animals	No. of patients	Percentage
Present	128	33.3
Absent	256	66.7

Table 22: Distribution based on contact with pets

Associated co-morbid conditions

History of taking systemic steroid therapy for was seen in a patient with connective tissue disorder and another with rheumatoid arthritis. Diabetic history was given by 24 patients. Bronchial asthma(BA) was present among 8 patients while 4 patients had past history of tuberculosis(TB) and 5 patients were retroviral disease (RVD/HIV) positive.

Systemic steroid therapy	No of patients	Percentage
Present	2	.5
Diabetes	No of patients	Percentage
Present	24	6.3
BA/HIV/TB	No of patients	Percentage
Present	17	4.5

Table 23: Distribution of patients based on associated health conditions

Examination

General physical examination

Mean Height(±SD) of patients in this study was 158.11cms (10.932), weight(±SD) was 57.46 kgs (9.716) and BMI was 22.95 (3.3489931). 42 patients (11%) among 384 had pallor.

Examination	Mean	Percentage
Height(cms)	158.11	10.932
Weight(kgs)	57.46	9.716
BMI	22.95	3.348
Pallor	**No. of patients**	**Percentage**
Present	42	11
Absent	342	89
Total	384	100

Table 24: General physical examination of study group

Body Surface Area Involvement

147 (38.3%) patients had body surface area(BSA) involvement of 5-10% , followed by 127 (33.1%) patients with more than 10% body surface area involvement while 110 patients(28.7%) had less than 5% body surface area involvement.

BSA	No. of patients	Percentage
<5% (A)	110	28.7
5-10% (B)	147	38.3
>10% (C)	127	33.1
Total	384	100.0

Table 25: Distribution of patients based on BSA

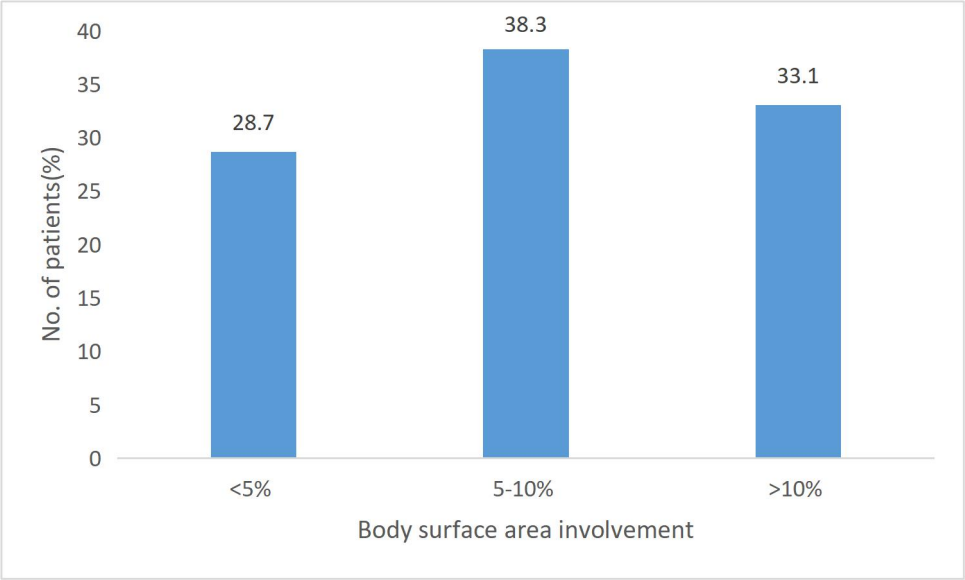


Figure 7: Distribution of patients based on BSA

Cutaneous Examination

Most common cutaneous site of involvement was found to be groin (56%) followed by gluteal area (28.1%) while least common site over all was found to be beard (1.8%) followed by scalp(2.6%).

Site of presence of lesion	No. of patients	Percentage
Scalp	10	2.6
Face(non bearded region)	87	22.7
Beard	7	1.8
Neck	23	6.0
Chest	69	18
Back	25	6.5
Abdomen	100	26
Upper limb(except hands)	80	20.9
Lower limbs(except feet)	70	18.3
Gluteal region	109	28.4
Groin	215	56.0
Dorsum of feet	13	3.4
Dorsum of hands	37	9.6
Palms	18	4.7
Soles	18	4.7
Nails	26	6.8

Table 26: Distribution of patients based on site of tinea lesion

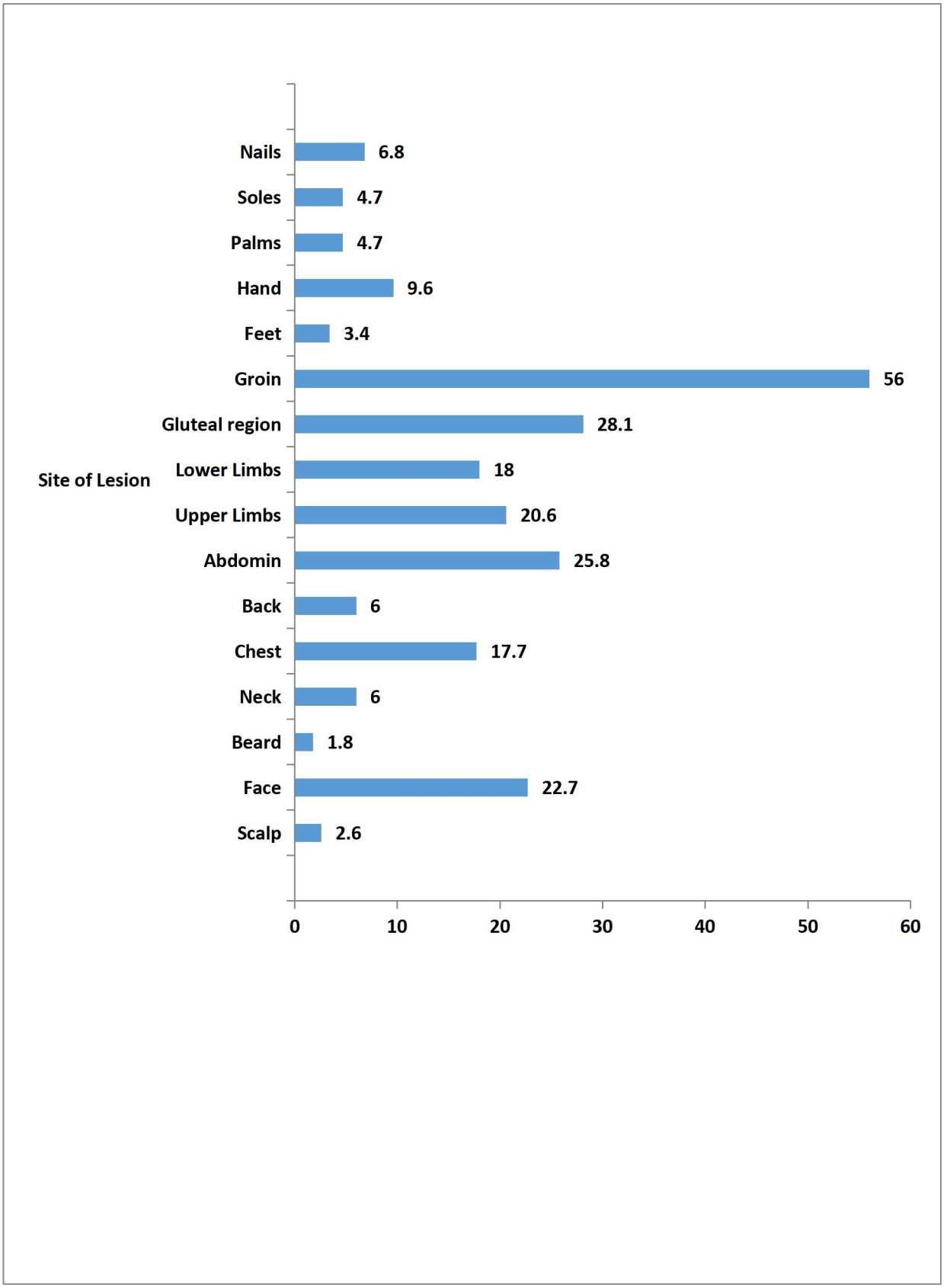


Figure 8: Distribution of patients based on site of lesion

Correlation Between Age and site of lesion

A correlation between age and site of lesion was found to be statistically significant in case of scalp lesion. 80% of tinea capitis was seen in patients less than 10 years of age.

Age (Years)	Scalp			P value
	Absent	Present	Total	
< 10	0(0%)	8(80.0%)	8(2.1%)	P=0.0001*
10 - 19	48(12.8%)	2(20.0%)	50(13.0%)	
20 - 29	92(24.6%)	0(0%)	92(24.0%)	
30 - 39	94(25.1%)	0(0%)	94(24.5%)	
40 - 49	65(17.4%)	0(0%)	65(16.9%)	
50 - 59	40(10.7%)	0(0%)	40(10.4%)	
60+	35(9.4%)	0(0%)	35(9.1%)	
Total	374(100)	10(100)	384(100)	
*p value <0.05 is significant				

Table 27: Correlation between age and tinea capitis

Scaling

Scaling over the lesion was present in 231 (60.2%) patients.

Scaling	No. of patients	Percentage
Present	231	60.2
Absent	153	39.8
Total	384	100.0

Table 28: Distribution of patients based on presence of scaling

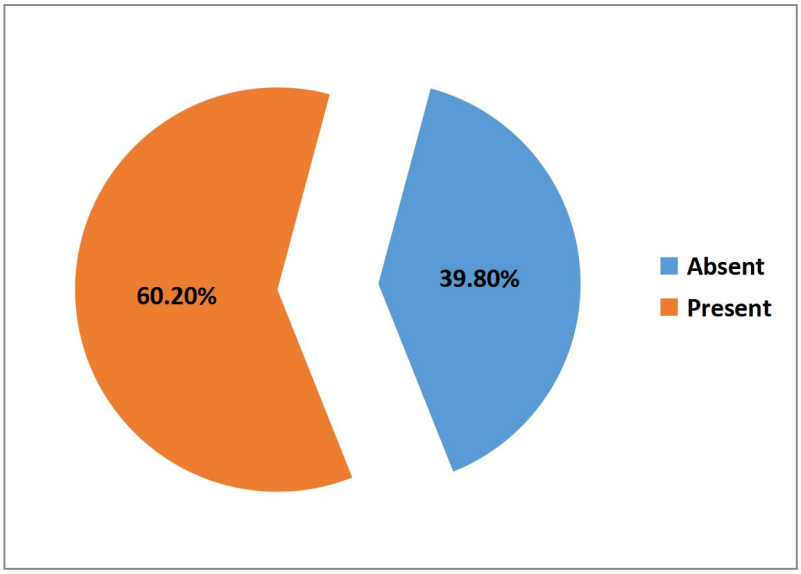


Figure 9: Distribution based on presence of scaling

Atypical Presentation

Unusual presentation of tinea was seen in 16 patients (4.1%) with 5 patients having eczema like , 1 patient with psoriasiform like tinea and 10 patients with Tinea pseudoimbricata

Examination	No. of patients	Percentage
Eczema like	5	1.3
Psoriasiform	1	.3
T.pseudombricata	10	2.6

Table 29: Distribution of patients based on atypical presentation

Clinical Diagnosis

Most common clinical diagnosis was Tinea corporis (66.1%) followed by Tinea cruris (55.5%) while least common was Tinea barbae (1%) and Tinea capitis (2.6%)

Examination	No. of patients	Percentage
Tinea corporis	254	66.1
Tinea cruris	213	55.5
Tinea barbae	4	1.0
Tinea faciei	83	21.6
Tinea capitis	10	2.6
Tinea pedis	23	6.0
Tinea manuum	18	4.7
Tinea unguium	27	7.0
Total	384	100.0

Table 30: Distribution of patients according to Clinical diagnosis

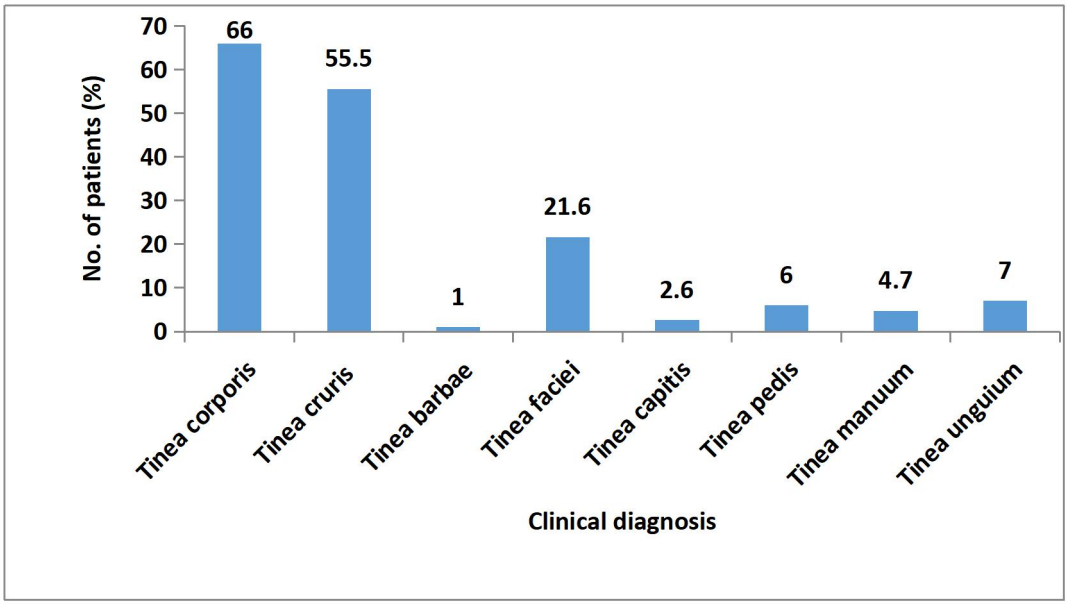


Figure 10: Distribution of patients according to Clinical diagnosis

Mixed Clinical type of dermatophytoses

Most commonly seen mixed type of clinical diagnosis were tinea corporis along with tinea cruris, present in 99 patients(25.8%) followed by tinea corporis along with tinea cruris and tinea faciei seen in 31 patients(8.1%).

Clinical Diagnosis	No. of patients	Percentage
T.corporis +T. manuum+T.unguium	1	.3
T.corporis+ T. pedis	8	2
T.corporis+T. cruris	99	25.8
T.corporis+T.cruris+T.faciei	31	8.1
T. corporis+T.cruris+T.faciei+T. manuum	1	.3
T.corporis+T. cruris+T. faciei+T. pedis	6	1.6
T. corporis+T. cruris+T. manuum	3	.5
T. corporis+T. cruris+T. manuum+T. ungium	1	.3
T. corporis+T. cruris+T. pedis	5	1.3
T. corporis+T. faciei	22	5.7
T. corporis+T. faciei+T. manuum	1	.3
T. corporis+T. manuum	9	2.3
T. corporis+T. pedia+T. manuum	1	.3
T. corporis+T. ungium	3	.8
T. cruris + T. faciei	5	1.3
T. cruris+T. barbae+T. manum	1	.3
T. cruris+T. ungium	1	.3
T. faciei + T. manuum	1	.3
T. pedia+T. manuum	1	.3
Total	199	52.2

Table 31: Distribution of patients based on mixed type of dermatophytoses

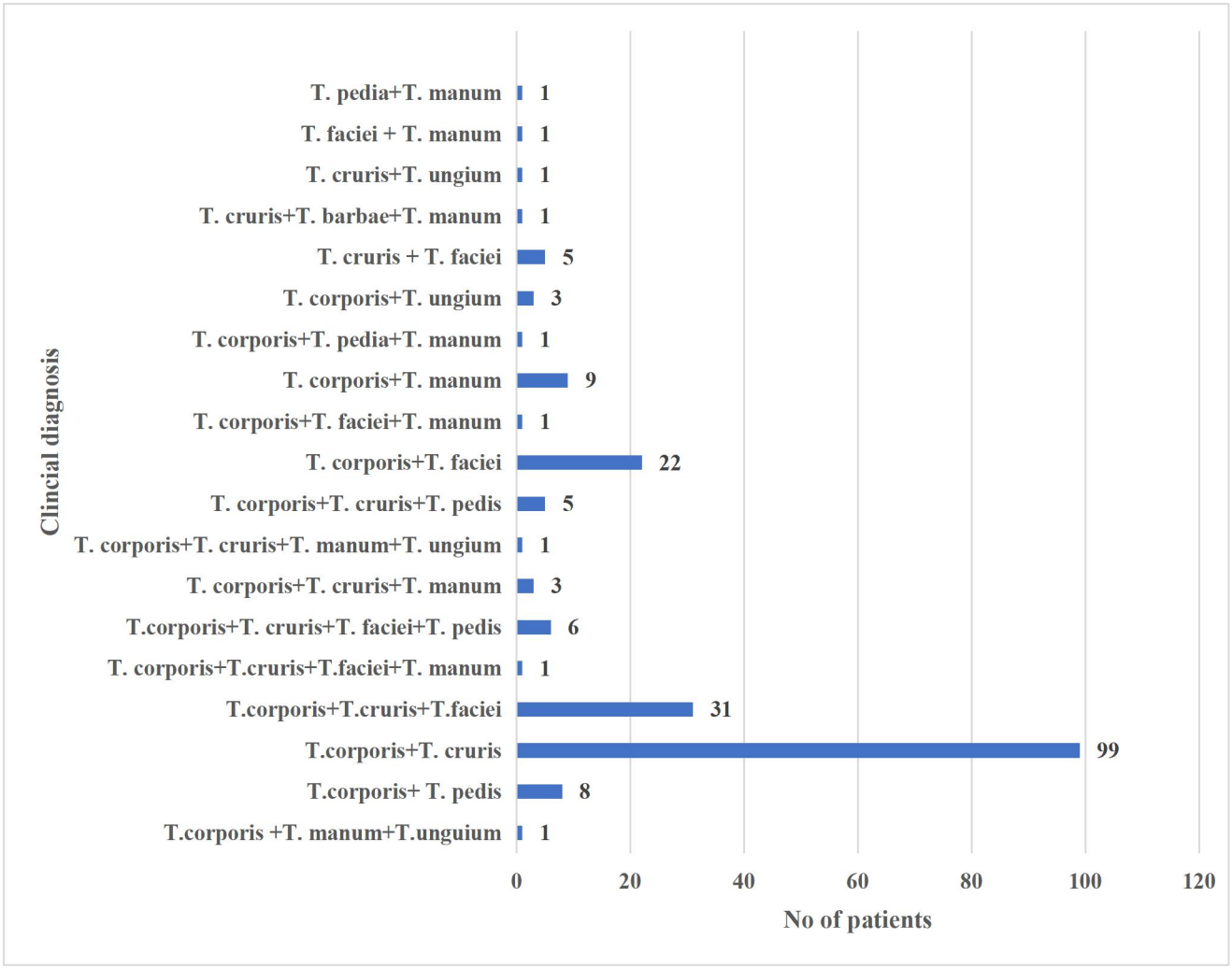


Figure 11: Distribution of patients based on mixed type of dermatophytoses

10% KOH Mount For Direct Microscopy

Examination of skin scrapings with 10% KOH solution showed presence of fungal hypahe in 317 patients (82.6%).

Fungal hyphae on KOH mount	No. of patients	Percentage
Present	317	82.6
Absent	65	16.9

Table 32: Direct microscopy of KOH mount

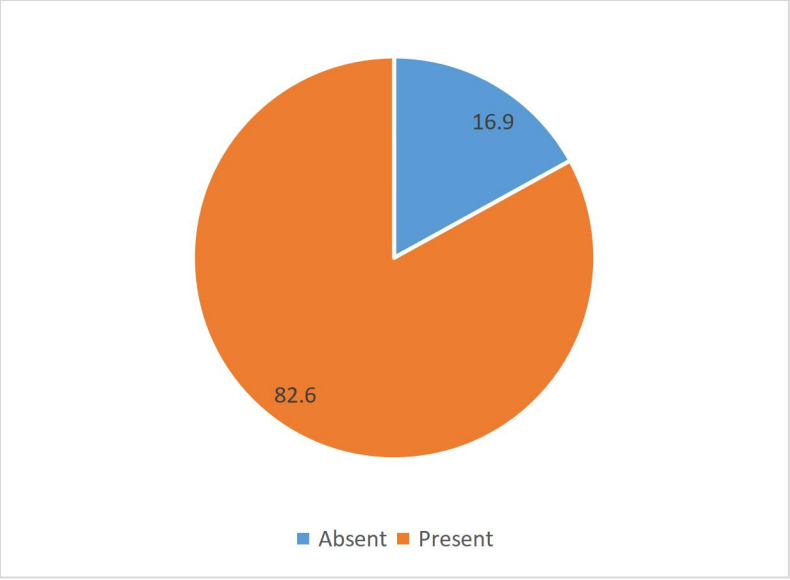


Figure 12: Direct microscopy of KOH mount

Correlation between KOH mount and fungal culture

Both microscopy and culture was positive in 192 samples (60.2%) while 127 (39.8%) samples were positive by microscopy but negative by culture. Negative by microscopy but culture positivity was seen in 27 (41.5%) samples and both negative was evident in 38 cases (58.5%).

Culture positive for dermatophytes	10% KOH mount	
	Absent	Present
Positive	27(7%)	192(50%)
Negative	38(9.9%)	127(33.1%)

Table 33: Comparison of 10% KOH mount and Dermatophytic growth on culture media

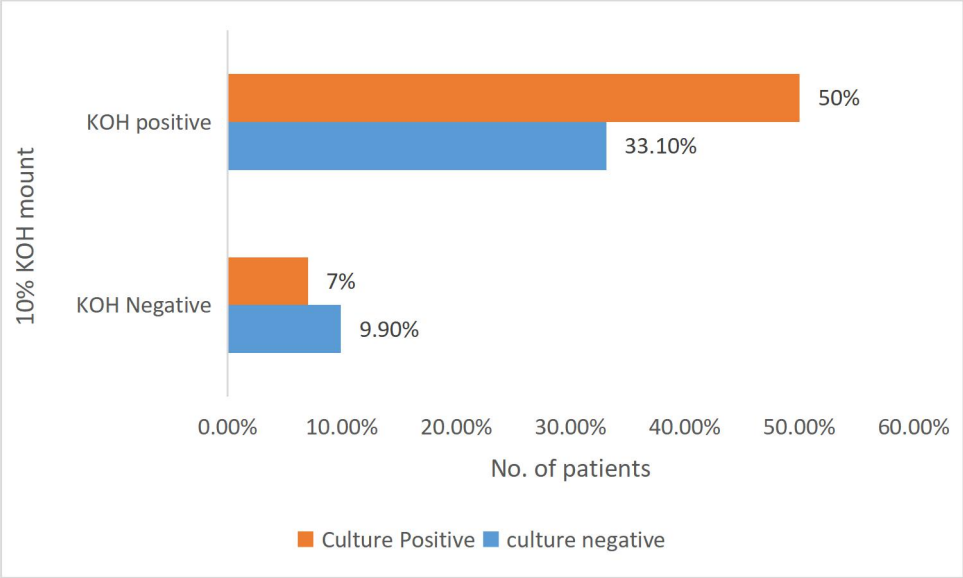


Figure 13: Comparison of 10% KOH mount and dermatophytic growth on culture media

Fungal culture

Growth on the SDA with or without antibiotics media or dermatophyte test media was seen in 249 patient samples (64.8%). Among them positive growth for dermatophytes was seen in 219 samples (57%).

Culture positive for growth	**Number of samples**	**Percentage**
Present	249	64.8
Absent	135	35.2
Total	384	100
Culture positive for dermatophytes	**Number of samples**	**Percentage**
Present	219	57.0
Absent	165	43.0
Total	384	100

Table 34: Fungal growth on media

Dermatophytic growth on culture media

Among the medias with dermatophytic growth (219), 209 patient samples had growth on dermatophyte test media (95.4%) , 201 patient samples had growth on SDA with antibiotics media (91%) while 76 patient samples showed growth on plain SDA media (34%).

Dermatophytic growth on media	Number of medias	Percentage(%)
SDA without antibiotic		
Present	76	34.7
Absent	143	65.3
SDA with Cycloheximide and Chloramphenicol		
Present	201	91.7
Absent	18	8.3
Dermatophyte test media		
Present	209	95.4
Absent	10	4.6
Total	219	100.0

Table 35: Dermatophytic growth on culture media

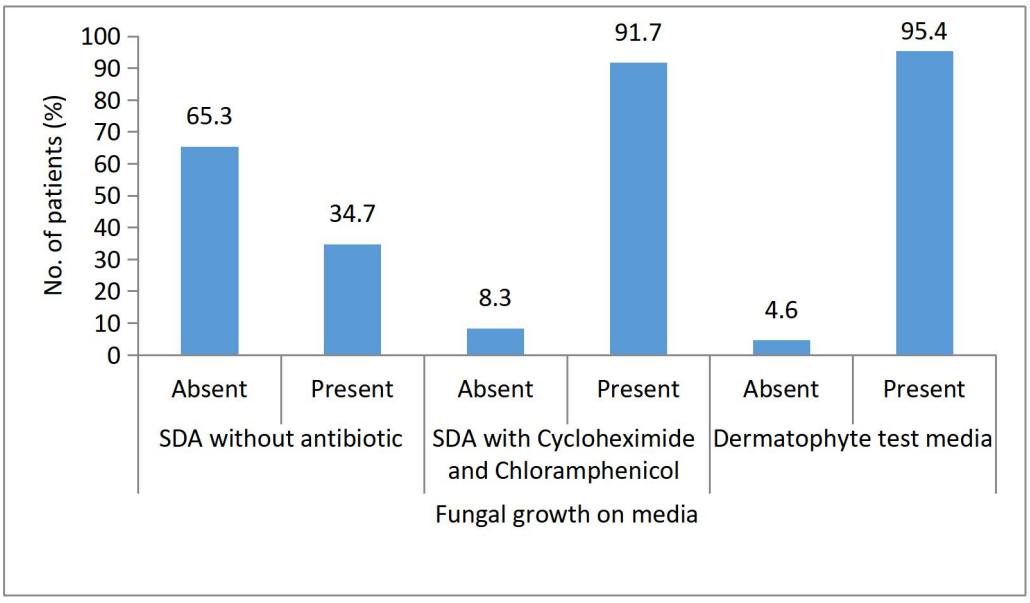


Figure 14: Dermatophytic growth on culture media

Isolated Species of Dermatophytes

In this study a specie isolation was possible from 219 samples (57%) out of 384 samples collected. *T. mentagrophytes* was isolated from a maximum of 96 patient samples (25%). *T. rubrum* from 83(21.6%), *T tonsurans* from 32(8.3%), and *M. canis* from 8(2.0%) patient samples were isolated. *T. mentagrophyte* (43.84%) was noted to be the most commonly isolated specie followed by *T. rubrum* (37.90%).

Organism	No. of species isolated	Percentage(%)
T.mentagrophyte	96	43.84
T.rubrum	83	37.90
T.tonurans	32	14.61
M. canis	8	3.65
Total	219	100.0

Table 36: Distribution of isolated species of dermatophytes

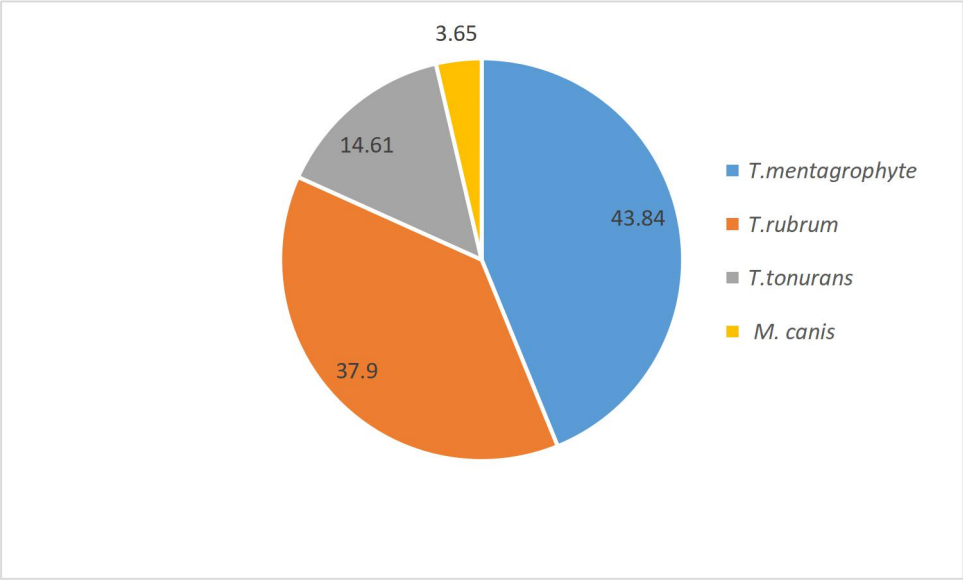


Figure 15: Distribution of isolated species of dermatophytes

IMAGES

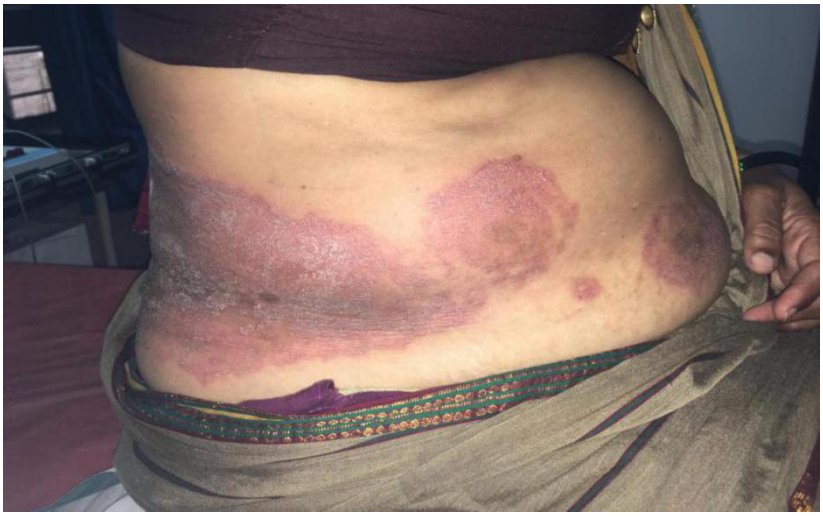


Figure 16: Tinea corposis spreading from the waistline, erythematous annular patches with scaling seen

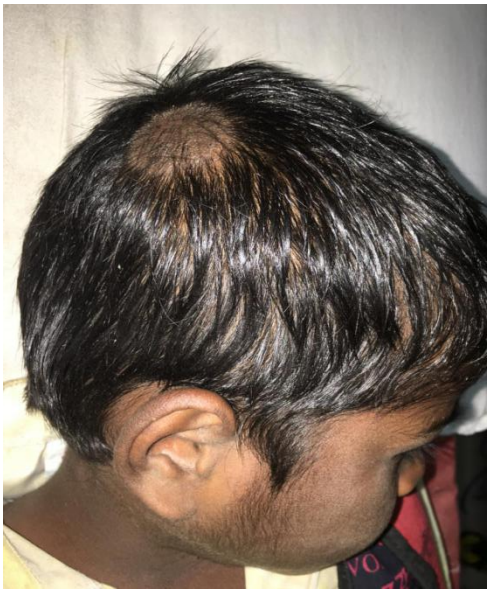


Figure 17a: Soliatary tinea capitis: indurated boggy swelling with hair loss

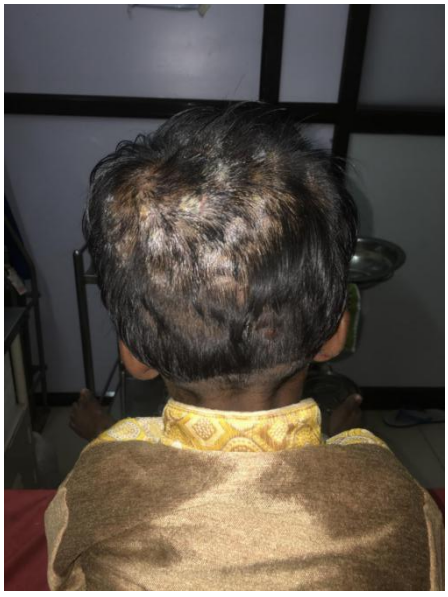


Figure 17b: Tinea capitis multiple patchy loss of hair with scaling

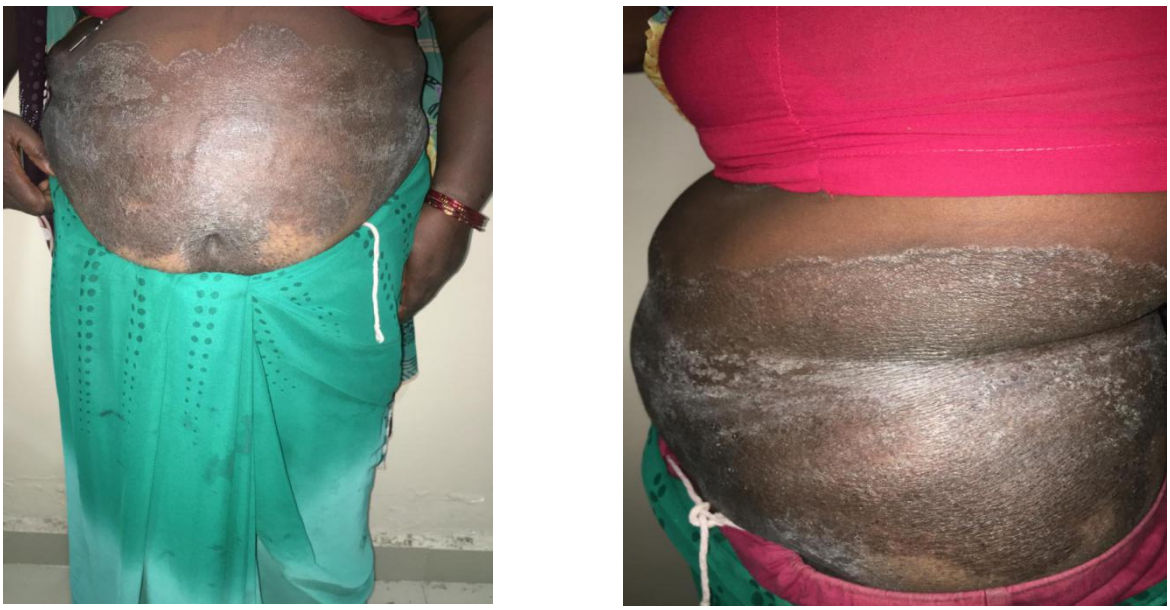


Figure 18a & b: Tinea corporis in a middle age female patient female with extensive hyperpigmented scaly patches

Figure 19: Tinea faciei with raised active margin and central clearance.

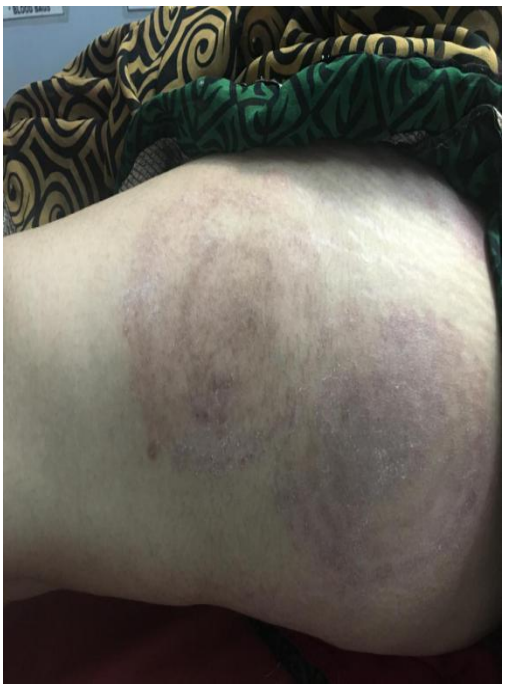


Figure 20: Tinea pseudoimbricata, ring within ring appearence

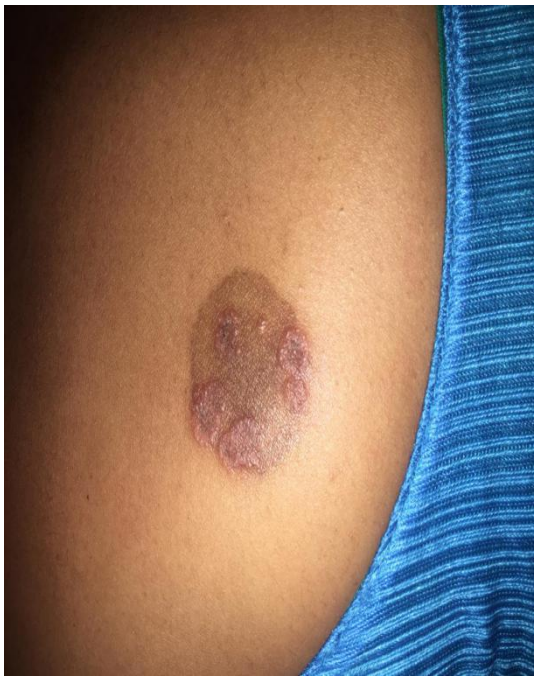
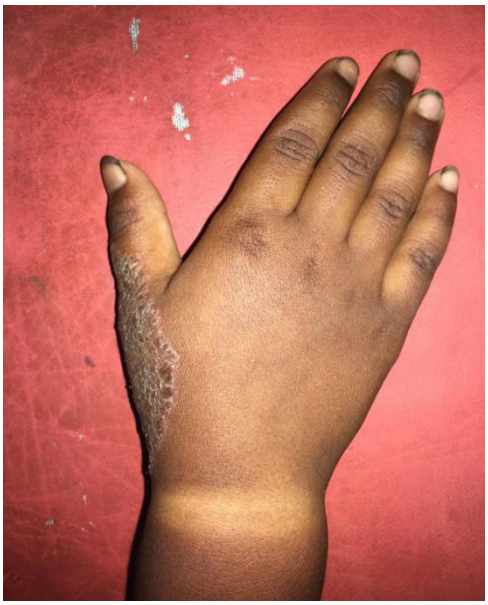


Figure 21: Tinea recidivans, appearance of lesions at the periphery of the old healed lesion



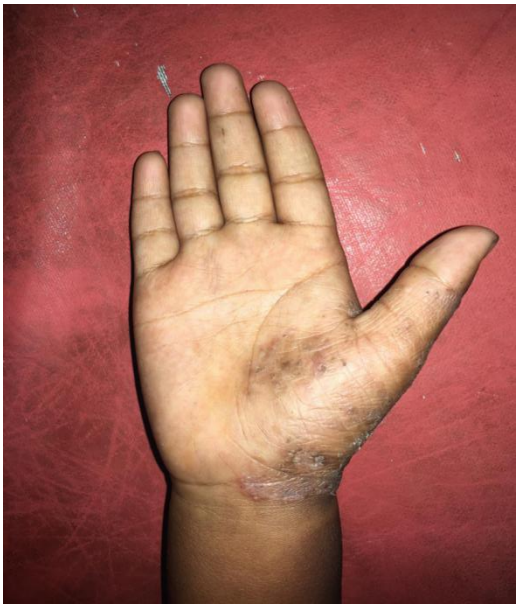


Figure 22 a & b: Tinea corporis(a) spreading to the palm(b)

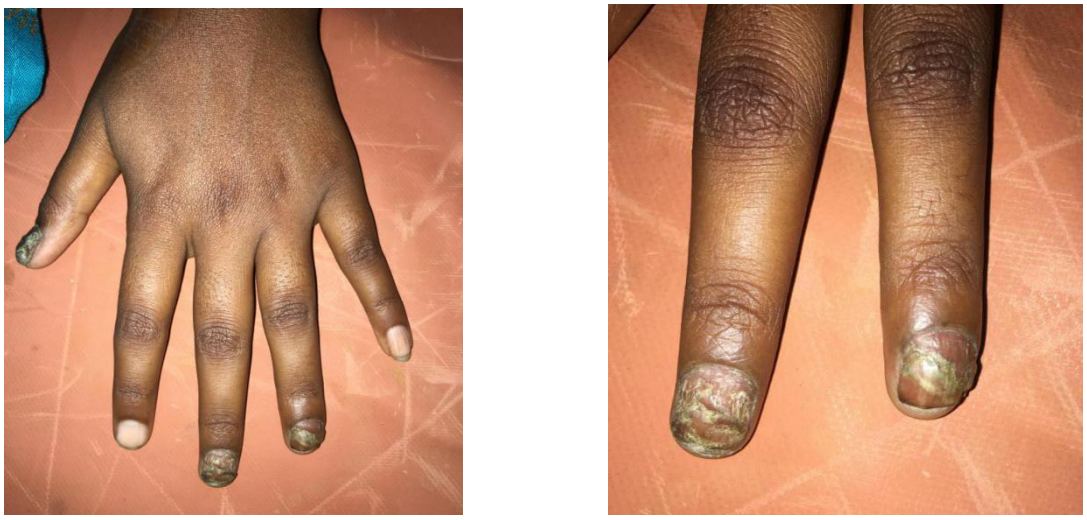


Figure 23a & b: Onychomycosis of thumb, middle and ring finger nails showing yellowish discolouration with dystrophy of nail plate

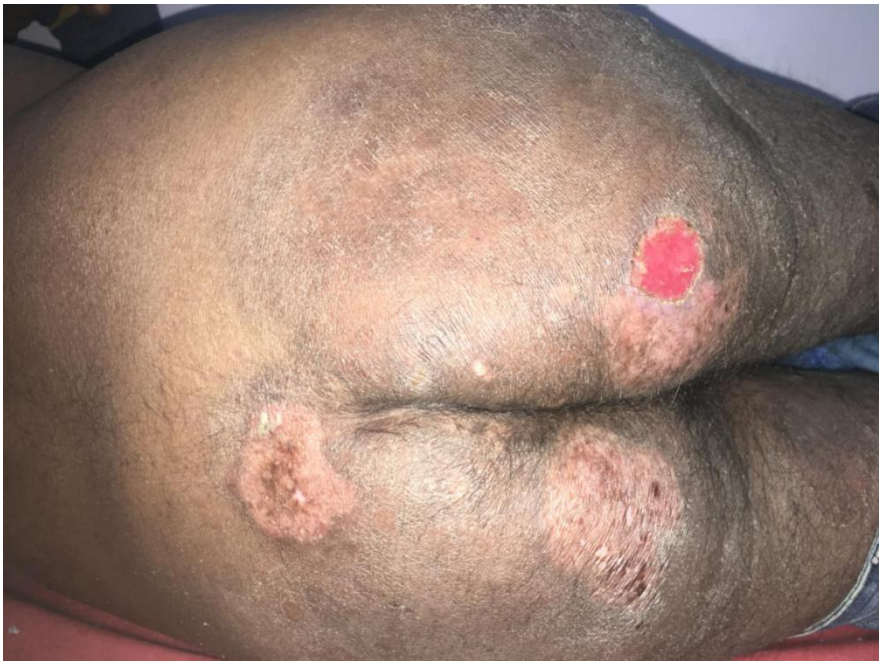


Figure 24: Immunocompromised patient(RVD poitive) with extensive tinea corporis along with superfical ulcers over gluteal area as a consequence of topical steroid abuse

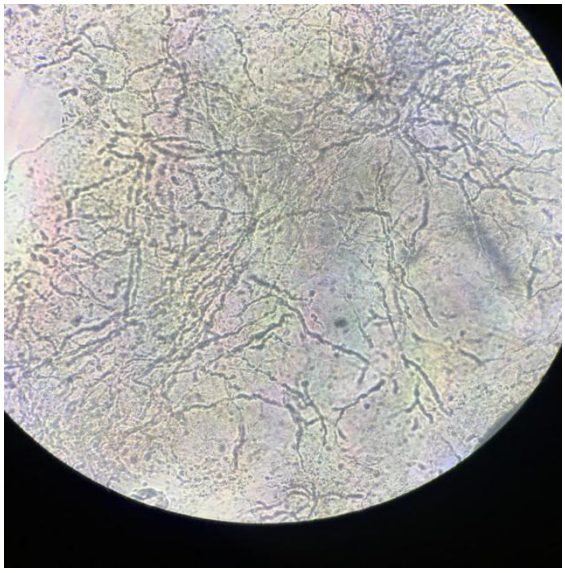


Figure 25: Direct microscopy of 10% KOH mount-

hyaline long branching septate hyphae

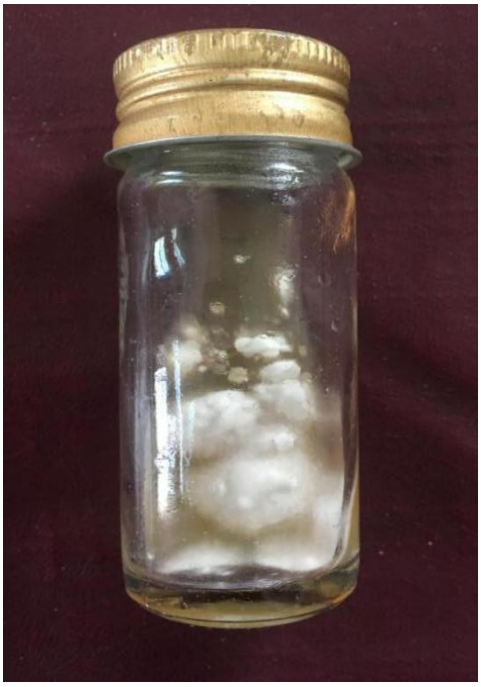
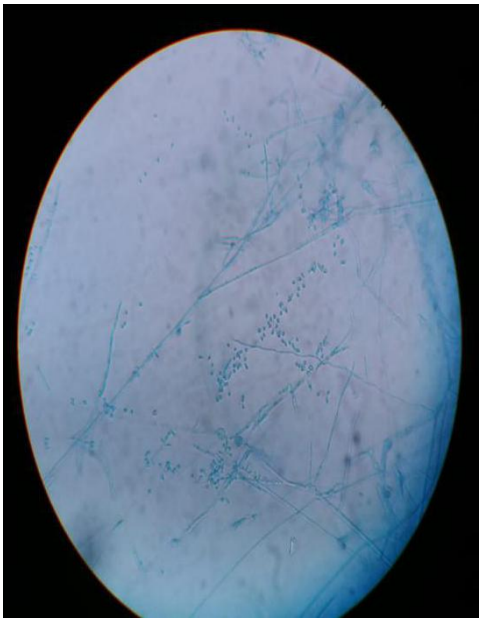


Figure 26a & b: White cottony growth on SDA

media

Figure 27: Dermatophyte test media prior to inoculation

Figure 28: Change in colour of DTM to pink from yellow following dermatophtyic growth



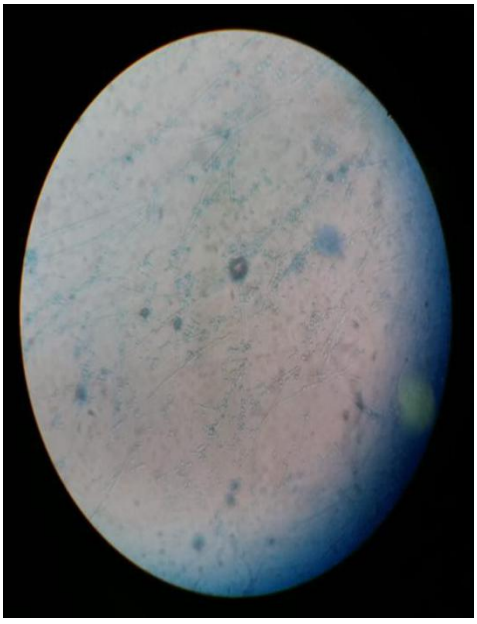


Figure 29a & b : Microscopic morphology of *T. mentagrophytes* on Lactophenol cotton blue mount- spiral hyphae with spherical microconidia in cluster

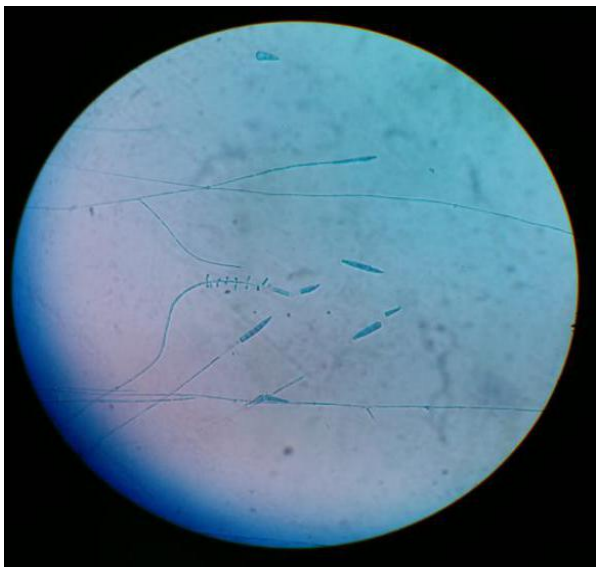


Figure 30: Microscopic morphology of *M.canis* on lactophenol cotton blue mount- thick-walled roughened and beaked macroconidia.

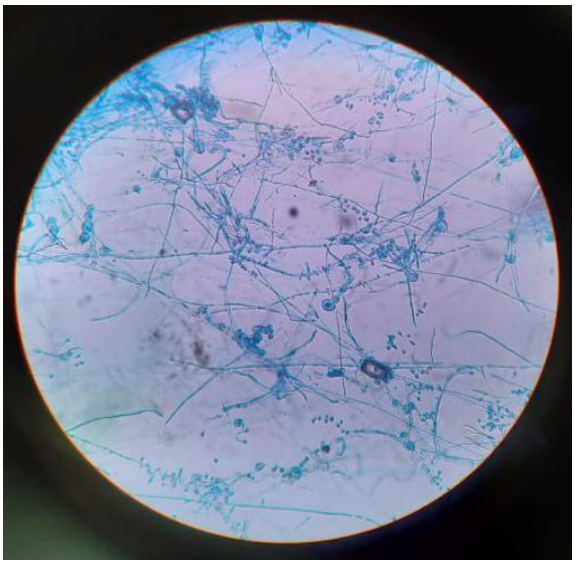


Figure 31: Microscopic morphology of *T. tonsurans* on Lactophenol cotton blue mount- numerous multiform microconidiia and cigar-shaped macroconidia

DISCUSSION

Age

The study highlighted that dermoatophytosis commmonly affected 30-39 years (24.5%) age group of patients which was closely followed by 20-29 years age group (24%). This is in accordance with studies done by Janardan *et al* [47]and Lavanya *et al* [48]. Studies on dermatophytosis by Monika *et al,*[49] Manjunath *et al*[50] and Isampreet *et al*[51] who reported age group of 20-30y followed by 30-40y as most commonly affected. The correlation of age and gender showed patients aged 30-39y in both the sexes contributed to maximum number of patients. The predisposition of infection among adults may be attributed to their greater physical activity, mobility, and perspiration that aids in the proliferation of the fungus.

Sex

The present study had maximum cases of dermatophytosis among males than females. Male to female ratio was 2:1. Almost all the studies have reported male predominance.[48,49,52,53,54] This pattern occurs as a result of higher exposure among males due to their chief outdoor activity. It can also be attributed to hesitant nature of women, who may feel socially embarrassed to be examined, as dermatophytosis occurs over intimate areas.

Occupation

Most of the patients infected with dermatophytosis were farmers by occupation, followed by students and homemakers. Similar results were established previously by Janardan *et al* [47] and Lavanya *et al*.[48] Increased prevalence of dermatophytosis among housewives and laborers can be explained by the nature of their day-to-day work leading to increased sweating, exposure to animals,[55] unfavourable weather condition and less awareness about the condition, whereas students are prone for dermatophytosis due to their increased exposure as a result of sharing of clothes or towels with roommates or among hostel inmates, habit of wearing jeans or other tight-fitted clothing, usage of occlusive footwear, and negligent attitude towards the disease.

Socioeconomic status(SES)

It was noticed in this study that the highest incidence of dermatophytosis occurred in middle SES group followed by lower SES group of patients. Bindu *et al*[56] in her study reported a similar finding. This was in contrast to studies by Janardan *et al*[47] and Ranganathan e*t al*[57] who reported higher incidence among lower socioeconomic group followed by middle socioeconomic group of patients. The tertiary care centre in this study, is located in the city which also has a government aided urban health centre where patients are treated free of cost, this can be the reason for predominance of middle socioeconomic group of patients than lower socioeconomic group of patients contrary to other studies. Increased incidence in the lower middle SES group occurs owing to sharing of fomites among close contacts, and poor personal hygiene.[58]

Duration

Maximum number of patients had history of duration of lesion for 1-3 months. Janardhan *et al*[47] reported maximum number of patients with duration of lesion for 1 month, while Agarwal *et al*[59] in his study had most patients with disease for longer than 3 months. Patient's heedless behaviour, habit of self medication, benign nature of the condition and limited access to higher health care centres can be attributed for prolonged duration of lesion at consultation.

Past history

History of previous medication

Present study shows majority(94.7%) of the patients taking various forms of treatment prior to consultation at the tertiary care centre. The clinical failure of antifungal therapy can be attributed to either persistent or recurrence of infection. Presence of recalcitrant clinical types, non-compliant nature of patients, persisting predisposing factors and other factors related to treatment further augment the usage of multiple medications. Clinical failure of topical antifungal therapy against dermatophytic infection involving glabrous skin, occurs as a consequence of involvement of vellus hairs. dermatophytic infection of the vellus hairs is due to infection with non-anthropophilic

fungi and prior use of topical corticosteroids. The fungi parasitize hairs and become inaccessible to the effect of topical antifungal agents.[60]

History of prior consultation

Most of the patients had history of self medication and only a handful of patients(6.8%) had history of consulting a dermatologist. This can be attributed to easy availability of many over the counter antifungal-steroid combination creams, need for rapid relief from the symptoms of dermatophytosis and benightedness among patients. However this relief is only short lived and further leads to abuse of such medication predisposing to recalcitrant dermatophytosis.[60]

History of similar complaints

In this study, 20% of the patients had history of similar complaints in the past. Maximum number of patients had recurrence after one year. This occurs as a result of inadequate or faulty treatment. Extension and spread of lesions, can occur as a consequence of chronic nature of some of the clinical types of dermatophytosis. They can also act as a reservoir of infection predisposing the patient to protracted course in the absence of appropriate treatment.[60]

Family History

History of similar complaint among family members or close contacts was seen in 37.2% of the patients. Similar results are reported in studies by Kucheria *et al*[49] and Mahajan *et al*.[52] This can be accredited to the practice of sharing of towels, pillows and other fomites among close contacts. Patient have less awareness regarding the modes of spread of dermatophytosis and thus there is prolonged exposure to infection or the predisposing factors.

Personal History

Personal hygiene

A great proportion of the patients had good personal hygienic practices while 27.9% had average to poor personal hygiene. Similar result is reported by Pathania *et al*.[54] Low socioeconomic status, crowded living condition and illiteracy can be other reasons for poor personal hygienic habits.

Clothing

Half of the patients(50.2%) gave history of frequently using tight garments like leggings, jeans, tying saree/dothi tightly. One third of the patients had history of wearing tight clothing in study done by Pathania *et al*.[54] In the background of hot and humid climatic conditions, tightly fitted clothes along the waistline, infra-mammary area and groin provide moist and occlusive environment, where the dermatophytes thrive.[60]

Pets

Current study had 33.3% of the patients with history of contact with animals such as dog, cats, or cattle. A personal history of pets helps to determine the source of infection as they are a possible risk factor for recurrent dermatophytoses.[54]

Associated co-morbid conditions

This study had 6.3% of patients with diabetes and 4.5% with HIV/TB. Patients with other pre-existing medical conditions on oral steroid therapy included 0.3%. Steroid therapy, diabetes, and HIV can cause immunosupression, putting them at a risk of developing dermatophytosis easily when they come in contact. Immunosupression can also predispose to extensive and invasive clinical forms of dermatophytosis.[61] Steroid therapy and on going treatment for tuberculosis can hinder the treatment of dermatophytosis.[62]

Examination

The study showed 38.3% of patients with body surface area involvement of 5-10% , followed by 33.1% patients with more than 10% body surface area involvement. Pithania *et al*[54] study showed maximum patients with less than 5% BSA involvement. Prolonged duration of lesion, history of steroid abuse, delayed consultation and recalcitrant nature of the disease can be considered the reason for changing trend of larger size and more number of lesions in individual patients.[43]

Cutaneous examination

On examination, most common site of involvement was found to be groin(56%) followed by gluteal area(28.1%). Sweating, maceration, alkaline pH, occlusive clothing, and poor hygiene, acts as a suitable milieu for fungal proliferation in intertriginous areas.

60% of the patients had tinea lesion with scaling. Steroid application in the recent past can result in less erythematous, less scaly tinea lesion with bizzare shape and indistinct border.[43] This may result in steroid modified tinea and poses difficulty in diagnosing the condition.

Atypical presentation

Tinea pseudoimbricata was seen in 2.5% of patients and eczema like tinea lesion was seen in 1.3% of patients. It has been seen in persons with immune suppression and also is a clue for application of preparations containing potent topical corticosteroids. Eczematization are said to be due to be due to inadequate clearing of the dermatophytes, owing to topical steroid application, and the inflammatory response that the viable dermatophytes would produce in those areas.

Clinical diagnosis

Most common clinical diagnosis was Tinea corporis (66.1%) followed by Tinea cruris (55.5%). This result was in comparable with a large number of previous works including Bindu *et al,* Singh *et al,*. Ramaraj *et al*, Lavanya *et al* and Janardan *et al*.[47,48,53,56] Correlation between age and site of lesion showed statistical significance in case of tinea capitis whereby 80% of tinea capitis, was seen in children less than 10 years of age. This result was in accordance with Pai *et al* study on tinea capitis.[63]

Laboratory investigations

In our study, overall KOH positivity and culture positivity was 82.6% and 57% respectively. 50% of the cases were both KOH and culture positive while 9.9% were negative on both microscopy and culture. Various other studies revealed KOH positivity rates ranging from 49% to 100% and culture positivity ranging from 20.15 % to 79.1%.

Siddappa *et al*[64] reported 100% positivity by KOH and 49% positivity by culture. Janardan *et al*[47] reported 90% positivity by KOH and 72% positivity by culture. Lavanya *et al* reported 70.48% positive by KOH and culture and 33.33% culture positivity.[48] Isampreet *et al* had 52% KOH positive and 56% culture positive.[51]

Overall culture positivity was 64.8% and culture positive for dermatophytoses was 57%. Non-dermatophytic growth included *Aspergillus species, Penicillium species* and *candida species* Similar results were reported in studies by Isampreet *et al*[51] and Vyas *et al*[65]. The culture negativity could be due to bacterial contamination during collection of sample, nonviable fungus as a consequence of prior usage of topical anti-fungal agents or insufficient sample size due to reduced scaling as a result of topical steroid application.

Maximum dermatophytic growth was seen on dermatophyte test media (95.4%) followed by SDA with Cycloheximide and Chloramphenicol (91.7%). The effectiveness of DTM and SDA with Cycloheximide and Chloramphenicol was found to be almost equal but better than plain SDA media. This was similar to study by Singh *et al.*[66] *T. mentagrophyte* (43.84%) was noted to be the most commonly isolated specie followed by *T. rubrum* (37.90%). This result were comparable to Isampreet *et al,* Mahajan *et al* and Pathania *et al.*[51,52,54] Other species isolated included *T. tonsurans* (14.61%) and *M. canis* (3.65%). Alike previous studies *Trichophyton* was the most common genus responsible for dermatophytic infection. Earlier, study by Lavanya *et al*[48] from adjoining region showed *T. rubrum* as the predominant specie followed by *T. mentagrophytes.* This study demonstrates that the causative agent of dermatophytosis varies from place to place and the change from *T. rubrum* to *T. mentagrophytes* as seen in studies by Saxena *et al,* Isampreet *et al,* Mahajan *et al,* and Pathania *et al* is also well evident in this study. [51,52,54,67]

CONCLUSION

Dermatophytes are a specialized group of fungi that have evolved to invade, colonize, and infect the stratum corneum of the skin, hair shaft, and the nail by its virtue of production of proteases that bring about digestion of keratin. *Microsporum*, *Trichophyton* and *Epidermophyton* are the three genera of dermatophytes. The superficial infection caused by these dermatophytes is termed as dermatophytosis. There has been an appalling rise in overall number of cases of dermatophytosis in the recent past accompanied by increased proportion of difficult to treat, chronic, widespread, atypical, and recurrent cases in India.

A hospital based cross sectional clinico-mycological study, enrolling 384 patients was done to determine the epidemiological trends associated with dermatophytosis at a tertiary care centre. A detailed history was elicited regarding duration of the lesion, occupation, significant past, personal and family history. The patients were further evaluated to determine the clinical type of dermatophytosis. Specimen collected from the lesion was subjected to microbiological investigation such as 10% KOH mount to visualize fungal hyphae and culture on SDA, SDA with antibiotics media and DTM for specie isolation.

It was observed from the study that the mot commonly affected patients were 30-39years and essentially males. A majority of the patients belonged to lower middle socioeconomic strata with farming being the most common occupation encountered. Frequently patients had lesions for a duration of 1-2 month at consultation and a striking percentage(95%) of patients had history of using various forms of medication prior to consultation. Subsequently, many patients had super-added irritant contact dermatitis. History of similar complaints in the past was seen in 20% of the patients and similar complaints among family members or close contacts was seen in 37.20% of patients. A multitude of patients had history of wearing tightly fitted garments (50.8%), sharing of fomites(35.7%) and close contact with animals(33.3%). Diabetes mellitus was chiefly association with dermatophytosis in this study. The study highlighted tinea corporis as the most common clinical pattern of dermatophytosis followed by tinea cruris. Tinea corporis with tinea cruris was the

commonest presentation among the combination types. Direct microscopy of 10% KOH mount demonstrated fungal hyphae in 82.6% of patient's samples. Culture positivity was 57%. Predominant causative fungal species isolated was *Trichophyton mentagrophytes* followed by *Trichophyton rubrum.*

In this study, an increasing trend of dermatophytic infection was evident among adults and actively working individuals due to increased exposure and sweating. Dermatophytosis seems to have undergone a paramount change in its clinical pattern in the past few years with larger lesion and increased body surface area involvement. Topical corticosteroids used in combination with antifungal agents available over the counter are grossly abused, being applied at will for weeks, months and sometimes years. This leads to chronic, treatment resistant dermatophytosis. Clinical failure of antifungal therapy in patients with dermatophytosis can be attributed to persistence of predisposing factors, lack of personal hygiene and poor education regarding the infection, and its treatment aspects among the general public. Specie isolation from the study follows the trend in epidemiological transformation of most common causative specie of dermatophytosis, from *T. rubrum* to *T mentagrophytes*.

SUMMARY

A hospital based cross sectional clinico-mycological study of dermatophytosis at a tertiary care hospital, to determine its epidemiological trends was conducted from october 2018 to july 2020.

- A total of 384 patients with clinical suspicion of dermatophytosis irrespective of age and sex were included in the study.
- The most commonly affected age group in this study was 30-39 years.
- Males were predominantly affected than females.
- Patients in the study, predominantly belonged to middle socioeconomic status.
- Farmers formed the most common group followed by students, and homemakers.
- Maximum patients (42.2%) presented with 1-2 months duration of lesion.
- Only 5% of the patients had no history of previous treatment.
- Half of the patients in the study had history of self medication.
- Similar complaints in the past was seen in 20% of the patients.
- One third of the patients had similar complaints among family member or close contacts
- Wearing tightly fitted garments (50.8%), sharing of fomites(35.7%) and close contact with animals(33.3%) was seen associated in the development of dermatophytosis
- Diabetes mellitus was the most common association with dermatophytosis in this study.
- Multiple body site involvement and presence of larger lesions were far more common in this study than single site infection.
- Tinea corporis was the most common clinical pattern followed by Tinea cruris. Tinea corporis with tinea cruris was the commonest presentation among the combination types. Direct microscopy of 10% KOH mount demonstrated fungal hyphae in 82.6% of patients. Culture positivity was 57%.
- *Trichophyton mentagrophytes* was the most common organism isolated in this study followed by *Trichophyton rubrum, Trichophyton tonsurans and M. canis.*

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ANNEXURE I

ETHICAL CLEARANCE CERTIFICATE

B.L.D.E (Deemed to be University)
SHRI.B.M.PATIL MEDICAL COLLEGE HOSPITAL & RESEARCH CENTRE
VIJAYAPUR – 586103

IEC/No: 286/2018
17-11-2018

INSTITUTIONAL ETHICAL COMMITTEE

INSTITUTIONAL ETHICAL CLEARANCE CERTIFICATE

The Ethical Committee of this college met on 13-11-2018 at 03-15 PM scrutinize the Synopsis of Postgraduate Students of this college from Ethical Clearance point of view. After scrutiny the following original/corrected and revised version synopsis of the Thesis has accorded Ethical Clearance.

Title : A clinico-mycological study of dermatophytosis at a tertiary care hospital.

Name of P.G. Student : Dr Anusha.L.
Department of Dermatology, Venerology & Leprosy

Name of Guide/Co-investigator: Dr.Arun.C.Inamadar, Professor & HOD
Department of Dermatology, Venerology & Leprosy.

DR RAGHAVENDRA KULKARNI
CHAIRMAN
Institutional Ethical Committee
BLDEU's Shri B.M. Patil
Medical College,BIJAPUR-586103.

Following documents were placed before E.C. for Scrutinization:

1) Copy of Synopsis/Research Project
2) Copy of informed consent form.
3) Any other relevant documents.

ANNEXURE-II

PROFORMA

B.L.D.E.U'S SHRI B. M. PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTRE, VIJAYAPURA.
Department of Dermatology, Venereology and Leprosy.

Serial no :

Name :

Sex :

Age :

OPD No:

Address :

Lab No:

Occupation :

Socio economic status :

Personal hygiene :

H/O sharing towels/combs/pillows with infected persons:

HISTORY:

Present history :

Duration of the illness :

Past history& Treatment:

Family History:

Similar history in family members:

Diagnosed with tinea:

H/O Contact with animals:

Corticosteroid therapy :

Diabetes mellitus:

Bronchial asthma /HIV/TB:

Others:

EXAMINATION:

Height :

Body Weight :

Pallor :

Nutritional status: well nourished / poorly nourished:

Cutaneous examination:

Site of the lesion and number:

Scalp:

Face:

Beard :

Neck :

Chest :

Back :

Abdomen :

Upper limbs:

Lower limbs:

Gluteal region:

Groin :

Feet :

Hand :

Palms:

Soles:

Nails :

Others:

Number:

Colour :

Type of lesion : Erythematous Lesion/Non-Erythematous

Unusual presentation:

erythema multiforme-like/ seborrheic dermatitis-like /lupus erythematosus-like /dermatitis herpetiformis-like/ rosacea-like/ eczematous dermatitis-like/ psoriasis-like/ impetigo-like /polymorphous light eruption-like

Scaling : Present/Absent

CLINICAL DIAGNOSIS:

MICROBIOLOGICAL INVESTIGATION

Direct microscopy – KOH mount :

Culture – SDA without antibiotic :

SDA with Cycloheximide and Chloramphenicol :

DERMATOPHYTE TEST MEDIA :

ANNEXURE– III

CONSENT FORM

B. L.D.E. (Deemed to be University) SHRI B.M PATIL MEDICAL COLLEGE HOSPITAL AND RESEARCH CENTRE, VIJAYAPURA-586 103

TITLE OF THE PROJECT **:-** A CLINICO-MYCOLOGICAL STUDY OF DERMATOPHYTOSIS AT A TERTIARY CARE HOSPITAL

PG GUIDE **:-** DR. ARUN C.INAMADAR

PG STUDENT **:-** DR. ANUSHA. L

PURPOSE OF RESEARCH:-

I have been informed that this project will assess epidemiological trends of tinea cases among the patients attending skin OPD at SBMP medical college and hospital

BENEFITS:-

I understand that my participation in this study will help the investigator to know the Trends and Epidemiology of tinea cases among patients attending skin OPD at SBMP medical college and hospital

PROCEDURE:-

I understand that relevant history will be taken and I will undergo detailed clinical examination after which treatment will be given.

RISK AND DISCOMFORTS:-

I understand the possible complications that may occur during and after the procedure, i.e., post procedure pain, swelling and erythema at the site of collection of skin/nail scrapings or hair specimen.

CONFIDENTIALITY:-

I understand that medical information produced by this study will become a part of my hospital records and will be subjected to the confidentiality and privacy regulation of the said hospital. Information of a sensitive personal nature will not be a part of the medical records, but will be stored in the investigator's research file. If the data are used for publication in the medical literature or for teaching purposes no names will be used and other identifiers such as photographs and audio or videotapes will be used only with my special written permission. I understand I may see the photographs, videotapes and hear the audiotapes before giving this permission.

REQUEST FOR MORE INFORMATION:-

I understand that I may ask more questions about the study at any time concerned. Dr. Anusha. L is available to answer my questions or concerns. I understand that I will be informed of any significant new findings discovered during the course of this study, which may influence my continued participation.

REFUSAL OR WITHDRAWAL OF PARTICIPATION:-

I understand that my participation is voluntary and I may refuse to participate or may withdraw consent and discontinue participation in this study at any time without prejudice. I also understand that Dr. Anusha. L may terminate my participation in this study at any time after she has explained the reasons for doing so and has helped arrange for my continued care by my own physician, if this is appropriate.

INJURY STATEMENT:-

I understand that in the unlikely event of injury to me resulting directly from my participation in this study and if such injury were reported promptly, then medical treatment will be available to me, but no further compensation will be provided. I understand that by my agreement for my participation in this study, I am not waiving any of my legal rights.

I have explained to (patient's / relevant guardian's name) the purpose of the research, the procedures required, and the possible risks and benefits to the best of my ability in patient's own language.

_____ _____

Investigator / P. G. Guide Date

I confirm that …….(Name of the PG guide / chief researcher) has explained to me the research, the study procedures that I undergo and the possible risks and discomforts as well as benefits that I may experience. I have read and I understand this consent form. Therefore, I agree to give my consent for my participation as a subject in this research project.

_____ _____

Participant / guardian Date

_____ _____

Witness to signature Date

ANNEXURE IV

KEY TO MASTERCHART

M	Male
F	Female
Farm	Farmer
Stu	Student
HM	Home maker
Dri	Driver
T	Teacher
Mech	Mechanic
A dri	Auto driver
WM	Watchman
PM	Policeman
CW	Construction worker
Busi	Business
UE	Unemployed
G	Good
Av	Average
Po	Poor
U	Upper
UM	Upper middle
LM	Lower middle
UL	Upper lower
T	Tinea

Cor	Corporis
Cru	Cruris
Cap	Capitis
Ungi	Ungium
Ped	Pedis
Fac	Faciei
Man	Manuum
BA	Bronchial Asthma
HIV	Human Immunodeficiency Virus
TB	Tuberculosis
DM	Diabetes Mellitus
BMI	Body Mass Index
10% KOH	10% Potassium Hydroxide
BSA- Body Surface Area	
A	<5%
B	5-10%
C	>10%
SDA without Antibiotic	Sabouraud's Dextrose Agar without Cycloheximide and Chloramphenicol
SDA with Cycloheximide and Chloramphenicol	Sabouraud's Dextrose Agar with Cycloheximide and Chloramphenicol
DTM	Dermatophyte Test Media
Medication History	
T/S	Topical Steroids

O+T	Oral+ Topical
UM	Unknown Medication
OM	Oral Medication
Nil	No Medication
Mode of taking Medication	
GP	General Practitioner
OCT	Over the Counter
Derm	Dermatologist
Bathing	
1	Once Daily
2	Alternate day
3	Once in two days or more
P	Present
A	Absent
T. ment	*Trichophyton mentagrophyte*
T. rub	*Trichophyton rubrum*
T. ton	*Trichophyton tonsurans*
M. can	*Microsporum canis*

OPD No	AGE	SEX	OCCUPATION	PERSONAL HYGIENE	SOCIOECONOMIC STATUS	duration of lesion	past history: Medications: Type of medication	past history: Medications: Consultation	past history: recurrence	family history	Personal history: Bathing	Personal history: sharing clothing /shoes/comb/pillow	Personal history: Tight clothing	Personal history: h/o contact with animals	Personal history: h/o systemic steroid therapy	Personal history: DM	Personal history: BA /HIV/TB	Examination: Height (incm)	Examination: weight	Examination: BMI	Examination: Pallor	Cutaneous exam: Scalp	Cutaneous exam: Face	Cutaneous exam: Beard	Cutaneous exam: Neck	Cutaneous exam: Chest	Cutaneous exam: Back	Cutaneous exam: Abdomen	Cutaneous exam: Ulimbs	Cutaneous exam: ULlimbs	Cutaneous exam: Gluteal region	Cutaneous exam: Groin	Cutaneous exam: Feet	Cutaneous exam: Hand	Cutaneous exam: Palms	Cutaneous exam: Soles	Cutaneous exam: Nails	Cutaneous exam: others	Cutaneous exam: scaling	Cutaneous exam: unusual Pation	BSA	T Cor	T Cru	T bar	T fac	T cap	T ped	T man	T ung	Clinical diagnosis	Microbiological investigation: 10% KOH mount	Culture pos for growth	CULTURE posfor derophytes	Growth: SDA without antibiotic	Growth: SDA with Cycloheximide and Chloramphenicol	Growth: derophyte test media	Organism
148691	42	M	farm	av	LM	7.5	UM	GP	6m	P	2	P	A	P	A	P	P	163	65	24.5	A											P							P		A		P							T Cru	P	pos					
148155	11	M	stu	Po	UM	3	UM	OTC		A	1	A	A	A	A	A	A	138	32	16	A	P																	A		A					P				T cap	P						
148398	16	M	stu	Po	LM	0.5	NIL			P	3	A	P	A	A	A	A	170	60	20.7	P		p																P		A				P					T fac	P						
148275	42	F	HM	Po	UM	0.5	OM	GP	3m	A	1	A	P	A	A	A	P	150	66	29.3	A							P			P	P							P	ez	B	P	P							T Cor+T Cru	P	pos					
148896	26	M	stu	av	LM	3	TS	OTC		P	1	P	P	A	A	A	A	168	55	19.5	A			P															P	T.pi	A			P						T bar	P						
145871	30	M	Dri	av	UM	3	O+T	der		P	3	P	P	A	A	A	A	156	58	23.86	A		P																A		A				P					T fac	P						
146006	45	F	HM	av	LM	2	UM	OTC		A	2	A	P	A	A	P	A	170	66	22.8	A		P			P			P	P									P		C	P			P					T Cor+T fac	P	pos	pos		p	p	*T.men*
146108	56	M	PM	av	UM	5	O+T	OTC		A	1	P	P	A	A	A	A	163	52	19.62	A																P		P		B								P	T ung	P						
146144	22	M	farm	av	LM	6	OM	GP		P	1	P	A	A	A	A	A	155	58	24.16	A											P		P	P				P		C	P	P					P		T Cor+T Cru+T man	P						
146003	28	F	HM	av	LM	12	uM	GP		P	1	P	P	A	A	A	A	166	65	23.63	A							P		P	P	P							A		C	P								T Cor	A	pos	pos		P	P	*T.men*
146004	5	M		av	LM	1	UM	OTC		P	1	P	A	A	A	A	A	126	30	18.98	P	P																	P		A					P				T cap	P						
146611	71	M	UE	av	U	2	O+T	OTC		P	3	P	A	A	A	A	P	158	54	21.68	A								P	P	P	P							P		C	P	P							T Cor+T Cru	P						
146648	37	M	T	av	UM	3	OM	OTC		P	1	P	P	A	A	A	A	160	65	25.39	A		P		P	P		P	P	P	P	P		P					P		C	P	P		P					T Cor+T Cru+T fac	P						
146593	35	F	HM	G	LM	2	UM	OTC	6m	P	1	P	P	A	A	A	A	163	60	22.64	A							P			P	P							P		B	P	P							T Cor+T Cru	P	pos	pos	p	p	p	*M.can*
146454	48	M	farm	av	UM	1	NIL			A	2	A	A	A	A	P	A	172	62	21.01	A											P							P		A		P							T Cru	P						
144273	27	M	stu	av	UM	0.5	TS	OTC		A	2	P	P	A	A	A	A	160	58	22.65	A							P		P	P	P							P		C	P	P							T Cor+T Cru	P						
144349	54	M	farm	G	LM	2	UM	GP	1y	A	1	P	A	A	A	A	A	168	74	26.24	A					P		P											P		B	P								T Cor	P						
144501	39	M	Dri	av	UM	3.5	TS	GP		A	2	P	P	A	A	A	A	162	68	25.95	A		P					P	P			P							P		B	P	P		P					T Cor+T Cru+T fac	P	pos	pos	p	p	p	*T.rub*
145046	64	M	RETD. T	av	UM	2	OM	der		A	1	A	A	P	A	P	A	176	78	25.24	A					P		P					P						P		B	P					P			T Cor+T ped	P						

144349	54	M	SK	av	LM	1.5	NIL			A	2	P	A	A	A	P	P	168	65	23.04	A								P	P		P							A		B	P	P							T Cor+T Cru	A						
144671	36	M	A Dri	G	UM	3	UM	GP		A	2	P	P	A	A	A	A	170	70	24.22	A		P		P						P								A		B	P			P					T Cor+T fac	P						
144648	40	F	farm	Po	LM	6.5	OM	GP	1y	P	2	P	A	A	A	P	A	158	63	25.3	A											P							P		A		P							T Cru	P	pos	pos		p	p	*T.men*
145305	23	F	UE	av	LM	2.5	OM	OTC		A	2	P	P	A	A	A	A	156	53	21.81	A		P				P				P								P		C	P			P					T Cor+T fac	P						
145157	38	F	HM	Po	LM	2.5	UM	OTC		P	2	A	P	A	A	A	A	160	64	25	A							P			P	P							P	pso	B	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.men*
144880	28	F	HM	av	UM	3	O+T	OTC		P	1	A	P	A	A	A	A	154	60	25.31	A																P		A	T.pi	A								P	T ung	A						
143050	35	M	Dri	G	LM	1	UM	OTC		P	3	A	P	A	A	A	A	156	52	21.39	A										P	P							A		B	P	P							T Cor+T Cru	P	pos	pos	p		p	*T.men*
143186	37	F	farm	av	LM	1	NIL			A	1	P	A	A	A	A	A	152	53	22.94	P		P						P	P				P					P		C	P			P					T Cor+T fac	P	pos	pos		p	p	*T.rub*
143159	66	M	UE	av	UM	2	O+T	GP	6m	A	1	A	A	A	A	P	A	160	63	24.6	A					P		P			P								P		C	P								T Cor	P						
143160	62	F	HM	av	UM	3	O+T	OTC		A	2	P	P	A	A	A	A	158	63	25.3	A											P							A		C		P							T Cru	P	pos	pos		p	p	*T.rub*
143186	37	F	HM	av	LM	4	UM	GP		P	1	A	P	A	A	A	A	152	45	19.48	A					P		P						P					A		C	P								T Cor	A						
143304	25	F	stu	av	LM	3	O+T	OTC		P	1	P	P	A	A	A	A	152	52	22.51	A											P							P		A		P							T Cru	P						
143333	22	M	stu	Po	UM	5	O+T	der		P	1	A	P	A	A	A	A	155	78	32.5	A									P		P				P			A		B	P	P				P			T Cor+T Cru+T ped	P	pos	pos		p	p	*T.rub*
142640	37	M	Dri	Po	UM	6	OM	GP		P	3	P	P	P	A	A	A	150	40	17.77	P											P							P		A		P							T Cor+T Cru	P						
142058	29	M	stu	av	UM	7	O+T	OTC		A	1	A	P	A	A	A	A	164	54	20.14	A		P					P											P		B				P					T fac	P	pos	pos	p		p	*T.rub*
142370	19	F	stu	av	UM	5	OM	OTC		A	1	P	P	A	A	A	A	156	60	24.69	A		P								P	P							P		C	P	P							T Cor+T Cru	P	pos	pos	p	p	p	*M.can*
142849	40	F	farm	G	UL	5	O+T	der		A	1	A	P	A	A	A	P	163	55	20.75	A																P		P		A								P	T ung	P	pos					
142845	34	M	farm	G	LM	4	OM	GP		A	3	P	A	P	A	A	A	155	46	19.16	A		P									P							P		B		P		P					T Cru + T fac	P						
141919	63	M	farm	Po	UM	3.5	UM	GP	6m	P	2	P	A	P	A	P	A	150	42	18.66	A				P		P		P		P								P		C	P								T Cor	A						
2238	56	M	WEA VER	av	LM	2	O+T	OTC		P	1	A	A	A	A	A	A	158	78	31.32	A											P							A		B		P							T Cru	P	pos	pos		p	p	*T.men*
435239	24	M	stu	av	UM	3	UM	OTC		A	2	P	P	A	A	A	A	162	66	25.19	A		P								P	P							A		C	P	P		P					T Cor+T Cru +T fac	P						
419100	24	M	A Dri	av	LM	1.5	O+T	OTC	1y	A	2	P	A	A	A	A	A	163	59	22.26	A								P	P					P				P		C							P		T man	P	pos	pos		p	p	*T.men*
420018	20	M	stu	av	LM	3	UM	GP		P	1	A	P	A	A	A	P	158	68	27.3	A											P							A		B		P							T Cru	P						
438098	17	M	stu	av	U	3	O+T	GP		P	1	P	A	A	A	A	A	154	50	21.09	A										P						P		P		B								P	T ung	P						
377828	54	M	farm	G	UM	1	NIL			P	1	A	A	A	A	A	P	162	54	20.61	A															P			P		A	P					P			T Cor+T ped	P	pos	pos		p	p	*T.men*
430336	42	F	HM	G	LM	3	UM	GP		A	1	A	A	A	A	A	A	166	58	21.09	A							P	P			P							P		B		P							T Cru	A	pos	pos		p	p	*T.rub*
409597	40	M	T	av	LM	2	O+T	GP	3m	A	1	A	P	A	A	A	A	170	60	20.76	A		P		P						P	P							A		C	P	P		P					T Cor+T Cru+T fac	P	pos	pos		p	p	*T.rub*
409103	30	F	HM	Po	UM	2.5	O+T	OTC		P	1	A	P	A	A	A	A	172	58	19.66	P										P								P		A		p							T Cru	P						
407711	25	M	stu	G	UL	3.5	UM	OTC		A	1	A	P	P	A	A	A	155	53	22.08	A														P	P			P		B	P						P	P	T Cor +T man+T ung	P	pos	pos	p	p	p	*T.men*

398507	23	M	A Dri	av	LM	1.5	O+T	GP	6m	A	2	P	P	A	A	A	A	156	58	23.86	A		P					P		P		P							A		C		P		P					T Cru+T fac	A	pos	pos	p	p	p	*T.men*
398661	43	F	farm	G	LM	2	UM	OTC		P	1	P	A	A	A	A	A	164	60	22.38	A		P																P		A				P					T fac	P						
387450	19	F	stu	Po	UM	5	O+T	OTC		A	1	A	P	A	A	A	A	152	59	25.54	A											P							P		B		P							T Cor	P	pos	pos		p	p	*T.men*
400340	30	F	HM	av	UL	6	UM	GP	3m	P	1	A	P	P	A	A	A	153	62	26.49	A																P		P		A								P	T ung	P						
396033	18	M	stu	G	UL	4	O+T	GP		A	1	A	P	A	A	A	A	155	50	20.83	A							P		P	P	P							A		C	P	P							T Cor+T Cru	A	pos	pos		p	p	*T.men*
396079	37	M	Dri	av	LM	1.5	UM	OTC		A	2	A	P	A	A	A	A	154	46	19.4	P		P		P						P	P							A		C	P	P		P					T Cor+T Cru+T fac	P	pos	pos	p	p	p	*M.can*
407624	36	F	HM	G	UM	5.5	O+T	GP		A	1	P	P	A	A	A	A	152	58	25.1	A		P																A		A				P					T fac	P						
408370	34	M	farm	Po	UM	4.5	UM	OTC		A	1	P	A	A	A	A	A	160	60	23.43	A							P			P	P							P		C	P	P							T Cor+T Cru	P						
402149	30	M	stu	Po	LM	2	O+T	OTC	3m	P	1	A	P	P	A	A	A	165	68	25	A											P							P		B		P							T Cru	P	pos	pos		p	p	*T.rub*
401688	35	M	S.guard	av	LM	2	UM	OTC		A	2	P	A	P	A	A	A	172	60	20.33	P							P				P							A		B	P	P							T Cor+T Cru	P	pos	pos	p		p	*T.rub*
380994	30	F	farm	Po	UL	6	UM	GP	6m	P	1	P	A	A	A	A	A	155	70	29.16	A									P			P						A		A	P					P			T Cor+T ped	P	pos	pos		p	p	*T.ton*
377828	54	M	Dri	Po	UL	12	O+T	GP		P	1	A	A	A	A	P	A	163	68	25.66	A		P			P						P							P		B	P	P		P					T Cor+T Cru+T fac	P	pos					
384568	49	F	farm	Po	UM	9	UM	OTC	1y	P	2	A	P	A	A	A	P	156	64	26.33	A										P	P							P		B	P	P							T Cor+T Cru	P						
384413	26	M	farm	av	UL	16	UM	GP		P	1	A	P	P	A	A	A	177	58	18.53	A		P	P		P		P			P			P	P				P		C	P			P			P		T Cor+T fac+T man	P	pos	pos		p	p	*T.men*
383093	28	F	HM	Po	LM	12	O+T	GP		P	2	P	P	A	A	A	A	152	50	21.64	A		P	P															P	T.pi	C		P	P	P					T Cru+T bar+T man	P	pos	pos	p	p	p	*T.ton*
381156	57	M	BE	av	UM	1.3	O+T	der		A	1	P	A	P	A	P	A	172	56	18.98	P							P				P							P		B	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.men*
328824	36	M	Dri	Po	LM	1	NIL			P	2	A	P	A	A	A	A	175	56	18.3	A										P								P		A	P								T Cor	P						
324683	21	M	stu	G	UL	0.5	UM	der		P	1	A	P	A	A	A	A	158	62	24.89	A							P											A		A	P								T Cor	P	pos	pos		p	p	*T.rub*
313629	59	M	farm	av	UL	1.5	O+T	OTC	6m	A	1	A	A	A	A	P	A	178	60	18.98	A					P								P					A		B	P								T Cor	P						
314328	19	F	HM	av	UM	2.5	UM	OTC		A	1	P	P	P	A	A	A	167	58	20.86	A		P			P		P			P	P							P		C	P	P		P					T Cor+T Cru+T fac	P	pos	pos	p	p	p	*T.rub*
71734	23	F	HM	Po	LM	3	O+T	GP	3m	A	1	P	P	A	A	A	A	150	55	24.44	A									P									P		A	P								T Cor	A						
262421	35	M	WM	Po	LM	4	O+T	GP		P	3	P	A	A	A	A	A	166	52	18.9	A											P		P		P			P		B	P								T Cor	P	pos	pos	p	p	p	*T.ton*
262436	21	F	stu	G	LM	5	UM	OTC		P	1	P	P	A	A	A	A	152	45	19.48	A											P							A		A		P							T Cru	A	pos	pos		p	p	*T.rub*
337329	29	M	farm	Po	UL	2.5	O+T	OTC		A	1	A	A	A	A	A	A	156	55	22.63	P							P											P		A	P								T Cor	P	pos	pos	p	p	p	*T.men*
328824	36	M	POLICE	av	UM	4.5	O+T	OTC		P	2	P	P	A	A	A	A	160	56	21.87	A							P			P	P							P		C	P	P							T Cor+T Cru	P						
369456	31	M	farm	G	LM	1.5	O+T	der		A	1	P	A	A	A	A	A	170	61	21.1	A																P		P		A								P	T ung	P	pos	pos			p	*T.men*
317216	24	F	farm	G	LM	4.5	O+T	GP		A	1	A	A	P	A	A	A	153	42	17.94	P		P										P			P			P		C				P		P			T fac + T man	P						
359846	46	M	farm	av	UM	1	UM	GP	1y	A	1	P	A	P	A	A	A	158	45	18.07	A							P	P	P		P							A		C	P	P							T Cor+ T Cru	P						
373237	55	M	farm	av	UL	1	O+T	GP		A	1	P	A	A	A	A	A	159	56	22.22	A																P		P		A								P	T ung	P	pos	pos		p	p	*T.ton*

347628	19	M	stu	av	LM	1	NIL			P	1	P	P	A	A	A	P	163	55	20.75	P		P																P		A				P					T fac	A	pos	pos	p	p	p	*M.can*
344483	50	M	farm	G	LM	1.5	UM	GP		A	1	A	A	A	A	P	P	162	52	19.84	A							P	P		P	P							A		B	P	P							T Cor+T Cru	P						
371583	19	M	stu	av	UM	1.6	O+T	OTC		P	1	P	P	P	A	A	A	170	63	21.79	A		P			P													P		B	P			P					T Cor+T fac	P						
371125	7	M		av	UL	2	UM	OTC		P	1	A	A	A	A	A	A	120	25	17.36	A	P																	A		A					P				T cap	P	pos	pos		p	p	*T.rub*
368809	18	F	stu	Po	UL	4	O+T	GP	3m	P	1	P	A	P	A	A	A	155	42	17.5	P										P			P					P		B	P								T Cor	A						
337329	29	M	ENG	av	LM	2	UM	OTC		P	1	A	P	A	A	A	A	160	63	24.6	A		P						P	P		P							A		C	P	P		P					T Cor+T Cru +T fac	P	pos	pos		p	p	*T.men*
332679	16	M	stu	av	UL	2	O+T	OTC		A	2	P	P	A	A	A	A	156	60	24.69	A						p	P				P							A		C	P	P							T Cor+T Cru	P	pos					
343665	21	M	BUSI	av	LM	3	O+T	GP		A	1	P	P	A	A	A	A	175	60	19.6	A					P				P									P		C	P								T Cor	P	pos	pos	p	p	p	*T.rub*
347896	28	F	HM	av	UM	5	O+T	OTC		P	1	A	P	P	A	A	A	178	52	16.45	P		P						P		P	P							A		C	P	P		P					T Cor+T Cru+T fac	P	pos	pos	P	p	p	*T.ton*
332494	56	M	farm	av	LM	5	UM	OTC		A	2	P	A	A	A	A	P	162	58	22.13	A							P			P	P							A		C	P	P							T Cor+T Cru	P						
332475	44	M	farm	av	UM	6	UM	OTC	3m	P	2	A	A	A	A	P	A	163	75	28.3	A					P									P				P	ez	C	P						P		T Cor	P						
347628	19	M	BW	av	LM	4	UM	OTC		A	1	P	P	A	A	A	A	158	62	24.89	A											P							A		A		P							T Cru	P	pos	pos		p	p	*T.rub*
336784	38	M	CW	av	UL	2	O+T	GP		P	3	P	P	P	A	A	A	163	58	21.88	A		P		P			P	P		P								A		C	P			P					T Cor+T fac	P						
291505	29	F	HM	G	UL	1	NIL			A	1	A	P	A	A	A	A	155	55	22.91	A					P	p					P							P		C	P	P							T Cor+T Cru	P	pos	pos			p	*T.rub*
26739	48	M	farm	Po	LM	5	UM	GP		P	1	A	A	A	A	A	A	164	62	23.13	P							P		P		P							A		C	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.ton*
295106	40	F	HM	G	UM	3	O+T	OTC		A	1	P	P	P	A	A	A	169	58	20.35	A																P		A		A								P	T ung	P	pos	pos	p	p	p	*T.rub*
299842	49	M	farm	Po	LM	3.5	O+T	GP		A	1	A	A	P	A	P	A	170	62	21.45	A										P	P							P		B	P	P							T Cor+T Cru	P						
272363	28	M	farm	Po	LM	2.5	O+T	GP	1y	A	1	A	P	P	A	A	A	156	65	26.74	A		P		P							P							A		B		P		P					T Cru+T fac	P						
293107	29	M	ENG	Po	LM	1	NIL			A	1	P	P	P	A	A	A	152	62	26.83	A		P							P									A		C	P			P					T Cor+T fac	P	pos	pos	p	p	p	*T.men*
291505	29	F	HM	av	UL	1	UM	OTC		A	1	P	P	A	A	A	A	156	63	25.92	A											P							P		A	P	P							T Cor+T Cru	P						
263820	58	M	Dri	av	UM	2	O+T	GP	6m	A	2	A	A	A	A	P	A	152	61	26.4	P			P				P											P		B	P		P						T Cor+T fac	A	pos	pos		p	p	*T.rub*
257309	63	M	farm	Po	LM	2.5	UM	OTC		A	1	P	A	A	A	A	P	175	75	24.5	A							P	P										P		B	P								T Cor	P	pos	pos		p	p	*T.rub*
259790	35	F	HM	av	UM	4.5	O+T	der		P	1	P	P	A	A	A	A	172	60	20.33	A					P			P		P	P							P		C	P	P							T Cor+T Cru+T fac	P						
2548110	40	M	farm	av	UM	2.5	O+T	der		P	2	P	A	P	A	A	A	165	68	25	A		P						P			P							P		C	P	P		P					T Cor	P	pos	pos		p	p	*T.rub*
272964	65	M	MECH	G	LM	2.5	O+T	OTC		P	1	P	A	P	A	A	A	158	63	25.3	A							P		P	P		P						A		C	P								T Cru	P	pos	pos	p	p	p	*T.men*
257549	53	M	farm	G	UM	4.5	UM	OTC		P	1	A	A	A	A	A	A	173	58	19.39	A											P							P		B		P							T Cru	P						
268918	33	M	T	Po	UM	5	O+T	GP		prsent	1	A	A	A	A	A	A	163	63	23.77	A			P		P													P		B	P		P						T Cor+T fac	P	pos					
271376	56	M	A Dri	av	LM	6	O+T	GP		A	2	A	A	P	A	A	A	152	58	25.1	A		P								P	P							P		B	P	P		P					T Cor+T Cru+T fac	P	pos	pos		p	p	*T.men*
280906	17	M	stu	av	UM	4	UM	der		A	1	P	P	A	A	A	A	163	60	22.64	A											P							P		A		P							T Cru	P						

280879	18	M	stu	av	LM	6	O+T	OTC		A	1	P	P	A	A	A	A	158	65	26.1	A		P																A		A				P					T fac	P	pos	pos		p	p	*T.ton*
283129	27	M	B E	G	UM	2	O+T	OTC		A	1	A	P	A	A	A	A	152	48	20.77	A		P					P	P		P	P		P					P		C	P	P		P					T Cor+T Cru+T fac	P	pos	pos	p	p	p	*T.men*
26739	48	M	farm	Po	LM	3	O+T	GP	1y	A	1	P	A	A	A	A	A	168	50	17.73	P					P						P							A		B		P							T Cru	P						
184029	31	F	HM	Po	UM	4.5	UM	GP		A	2	A	P	A	A	A	A	150	45	20	A											P							P		A		P							T Cru	P	pos	pos		p	p	*T.rub*
238369	52	M	farm	av	LM	5	OM	GP		P	1	P	A	P	A	P	A	152	68	29.43	A							P											P		A	P								T Cor	A	pos	pos	p	p	p	*T.rub*
228259	28	F	HM	Po	UM	6	O+T	OTC		P	1	A	P	A	A	A	A	160	70	27.34	A								P		P	P		P					A		B	P	P							T Cor+T Cru	P						
241199	19	M	stu	av	LM	6.5	UM	OTC	1y	P	1	A	P	P	A	A	A	163	60	22.64	A		P																P		A				P					T fac	P	pos	pos		p	p	*T.ton*
237391	23	M	farm	av	UM	8	O+T	OTC		A	1	P	P	A	A	A	A	171	72	24.65	A					P			P	P									A		B	P								T Cor	P	pos	pos	p	p	p	*T.ton*
238369	52	M	farm	G	LM	12	UM	GP		A	2	A	P	A	A	A	P	176	70	22.65	A								P										P		A	P								T Cor	P	pos					
214461	32	M	TAIL OR	av	UM	1.5	O+T	OTC		preset	1	A	P	A	A	A	A	162	56	21.37	P								P			P							A		A	P	P							T Cor+T Cru	P						
178988	3	M		av	LM	0.5	UM	OTC		A	1	A	A	A	A	A	A	90	12	14.81	A	P																	A		A					P				T Cor+T ped	P	pos	pos	p	p	p	*T.men*
213199	40	M	farm	Po	LM	1.5	O+T	GP		prsent	1	A	A	A	A	A	A	165	69	25.36	A								P		P	P							A		C	P	P							T Cor+T Cru	P	pos					
178982	30	M	Dri	av	UM	4.5	TS	GP		P	3	A	P	A	A	A	A	152	56	24.24	A											P							P	T.pi	A		P							T Cru	P	pos	pos		p	p	*T.men*
213888	29	M	farm	av	LM	4	O+T	OTC		P	1	P	P	A	A	A	A	155	50	20.83	A											P							A		A		P							T Cru	P	pos	pos	p	p	p	*T.rub*
220103	21	M	Dri	G	LM	6	UM	GP		P	2	A	P	A	A	A	A	152	51	22.07	A								P			P		P	P		P		P		C	P	P					P	P	T Cor+T Cru+T man+T ungium	P	pos	pos		p	p	*T.men*
126025	60	F	HM	av	UM	4	O+T	GP		A	2	P	P	A	A	A	A	153	68	29.05	A		P			P				P	P	P	P						P		C	P	P		P		P			T Cor+T Cru+T fac+T man	P	pos	pos		p	p	*T.ton*
103389	26	F	farm	av	UL	5	UM	der		A	1	P	P	A	A	A	A	151	70	30.7	A							P											P		B	P								T Cor	P	pos	pos			p	*T.rub*
119585	38	M	farm	G	LM	1	O+T	GP	3m	A	1	A	P	A	A	A	A	150	58	25.77	A		P									P							A		A		P		P					T Cru+T fac	P						
218059	55	M	farm	Po	LM	2	O+T	OTC		A	1	P	A	A	A	A	A	153	56	23.93	A					P	P		P					P					P		C	P								T Cor	P	pos	pos			p	*T.rub*
214806	48	M	Dri	Po	UM	1	NIL			A	2	A	A	A	A	A	A	160	56	21.87	A																P		A		A								P	T ung	P	pos	pos	p	p	p	*T.men*
212003	30	M	SK	av	UL	2	O+T	GP		P	2	P	P	A	A	A	A	161	60	23.16	A							P	P	P		P	P						P		C	P	P				P			T Cor+T Cru+T ped	P						
157053	40	F	HM	av	UL	2	O+T	GP		A	1	P	P	P	A	A	A	153	66	28.2	A											P							P		A		P							T Cru	P	pos					
152510	45	F	HM	G	LM	3	O+T	OTC		preset	2	A	P	A	A	A	A	150	62	27.55	A		P																A		A				P					T fac	P	pos	pos		p	p	*T.ton*
157621	44	M	Dri	Po	UL	4.5	UM	OTC		A	1	A	A	A	A	A	A	162	58	22.13	P										P	P							P		B	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.rub*
136462	40	F	HM	G	LM	4.5	O+T	OTC		P	1	A	A	A	P	A	A	154	59	24.89	A													P			P		A		B	P							P	T Cor+T ungium	P	pos	pos			p	*T.men*
130436	34	M	farm	av	UM	4.5	O+T	GP		P	1	A	A	A	A	A	A	166	70	25.45	A		P			P	P	P				P							P		C	P	P		P					T Cor+T Cru+T fac	P						
163072	45	M	farm	av	LM	1.5	O+T	OTC		A	2	P	A	A	A	A	A	163	60	22.64	A										P								A		A	P								T Cor	P	pos	pos	p	p	p	*T.rub*
151800	30	M	Dri	G	UM	3.5	O+T	GP		A	1	P	P	P	A	A	A	158	65	26.1	A								P			P							A		B	P	P							T Cor+T Cru	P						
125172	20	F	stu	G	LM	5	UM	OTC		P	1	A	A	P	A	A	A	157	64	26.01	A		P																P		A				P					T fac	P	pos					*M.can*

123936	42	F	farm	av	LM	4	OM	GP		A	1	A	A	A	A	A	A	154	59	24.89	P											P							A		B		P							T Cru	A						
131707	40	F	HM	Po	UL	2	UM	OTC	6m	prsent	2	P	P	A	A	A	A	153	50	21.36	A									P	P	P							P		C	P	P							T Cor+T Cru	P	pos	pos	p	p	p	*T.ton*
149202	60	M	farm	Po	UM	3	O+T	OTC		A	2	P	A	A	A	A	A	154	54	22.78	A						P				P	P							A		C	P	P							T Cor+T Cru	P	pos					
188072	30	F	COOK	av	LM	7	O+T	OTC		P	1	A	P	A	A	A	A	160	60	23.43	A													P	P				A		B	P						P		T Cor+T man	P						
166610	18	M	stu	G	LM	8	UM	GP		prsesent	1	A	P	P	A	P	A	166	58	21.09	A											P							P		A		P							T Cru	P	pos					
166320	28	M	farm	G	UM	1	O+T	GP		A	1	P	A	A	A	A	A	165	48	17.64	A							P	P	P		P							A		C	P	P							T Cor+T Cru	P						
166318	18	F	stu	Po	UL	8	UM	GP		A	1	P	A	A	A	A	A	153	52	22.22	A																P		P		A								P	T ung	P	pos	pos		p	p	*T.men*
169093	40	F	HM	Po	LM	12	O+T	OTC		P	2	A	P	A	A	A	A	152	56	24.24	A		P			P		P			P	P				P			A		C	P	P							T Cor+T Cru	P	pos	pos	p	p	p	*T.rub*
172257	62	F	HM	av	LM	4.5	O+T	OTC		A	1	A	P	A	A	P	P	154	55	23.2	A					P						P							P		C	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.ton*
126557	12	M	stu	av	UM	6	O+T	GP		preset	1	P	A	A	A	A	A	144	40	19.7	A		P																A		A				P					T fac	P						
53056	28	M	H.man	Po	UL	12	O+T	GP		A	1	A	P	P	A	A	A	150	57	25.33	A											P							A		A		P							T Cru	P	pos					
53921	18	M	stu	Po	UL	1.5	O+T	GP	1y	P	1	A	P	P	A	A	A	152	65	28.13	A				p	p						p							P	T.pi	C	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.men*
72359	45	F	CW	av	LM	4.5	O+T	OTC		P	1	P	A	P	A	P	A	155	70	29.16	A		p						P					P					P		B	P			P					T Cor+T fac	P						
101975	22	M	Dri	av	UM	1	NIL		1y	A	1	A	P	P	A	A	A	155	56	23.33	P							P			P	P							A		B	P	P							T Cor+T Cru	P	pos	pos	p	p	p	*T.ton*
79748	63	M	farm	av	UM	3	UM	OTC		A	1	A	A	A	A	P	A	162	66	25.19	A						P	P											A		B	P								T Cor	P						
94092	52	M	farm	Po	LM	2	O+T	OTC		A	2	A	A	A	A	P	A	161	69	26.64	A											P							A		A		P							T Cru	A	pos					
68422	38	M	farm	G	LM	1.5	O+T	GP		A	2	P	A	A	A	A	P	156	88	36.21	A					P			P	P									P		C	P								T Cor	P						
49296	36	M	farm	G	LM	12	O+T	GP		A	1	A	A	A	A	A	A	157	59	23.98	A																P		P		A								P	T ung	P	pos	pos			p	*T.ton*
99299	37	M	Dri	Po	LM	1.5	UM	OTC	3m	A	1	A	P	A	A	A	A	161	52	20.07	A											P		P	P				P	ez	C		P					P		T Cru+T man	P	pos	pos		p	p	*T.rub*
62108	26	M	ENG	av	U	4.5	O+T	OTC		A	1	A	P	P	P	A	A	160	74	28.9	P		P					P			P	P							A		C	P	P		P					T Cor+T Cru+T fac	P	pos	pos	p	p	p	*T.men*
68143	35	M	CW	av	UM	6	O+T	OTC		A	1	P	P	A	A	A	A	155	76	31.66	A							P		P									P		C	P								T Cor	P	pos					
53178	22	F	HM	Po	UL	6	UM	der		P	2	A	P	A	A	A	A	150	52	23.11	A								P	P	P	P							A		C	P	P							T Cor+T Cru	P						
48985	6	M	stu	Po	LM	4.5	O+T	OTC		A	1	P	A	A	A	A	A	115	22	16	A	P																	A		A					P				T cap	P	pos	pos		p	p	*T.rub*
58655	45	F	HM	av	LM	6	O+T	OTC		A	1	A	P	P	A	A	A	150	52	23.11	A							P			P	P							P		B	P	P							T Cor+T Cru	P	pos					
65279	42	M	farm	av	UL	4	UM	GP		A	1	P	A	P	A	A	A	166	60	21.81	A											P							A		B		P							T Cru	P	pos	pos	p	p	p	*T.ton*
75731	22	F	HM	Po	UM	6.5	OM	der		presewnt	1	A	P	A	A	A	A	153	56	23.93	A							P		P	P	P							P		C	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.men*
478974	42	M	farm	Po	LM	3.5	O+T	OTC		P	2	A	A	A	A	A	A	162	76	29	A								P										A		B	P								T Cor	P						
475181	35	M	SK	av	LM	2.5	O+T	OTC		A	1	P	A	P	A	A	A	158	55	22.08	A		P					P				P							P		B	P	P		P					T Cor+T Cru+T fac	P	pos	pos	p	p	p	*T.men*
469433	18	M	stu	Po	LM	1.5	UM	GP		A	2	A	P	P	A	A	A	164	63	23.5	A					P							P			P			A		B	P					P			T Cor+T ped	P						

464189	47	F	farm	av	UL	1.5	O+T	OTC	1y	A	1	P	P	A	A	P	A	150	53	23.55	A		P						P	P		P							P		C	P	P		P					T Cor+T Cru+T fac	P	pos	pos	p	p	p	*T.men*
464040	35	F	farm	av	UM	1.5	O+T	OTC		P	1	P	P	P	A	A	A	151	50	21.92	A		P		P						P								A		C	P			P					T Cor+T fac	P	pos	pos		p	p	*T.men*
459271	25	M	stu	av	UL	1.5	O+T	GP		P	2	A	P	A	A	A	A	155	60	25	A											P							P		B		P							T Cru	P						
452172	21	M	stu	G	LM	2	UM	OTC		A	1	A	P	P	A	A	A	158	62	24.89	P											P							A		B		P							T Cru	A	pos	pos	p	p	p	*T.men*
55268	68	M	farm	av	LM	2	O+T	OTC		A	1	P	A	P	A	A	P	160	45	17.57	A										P								P		A	P								T Cor	P						
454152	25	M	Dri	av	LM	2	UM	OTC		A	2	A	P	P	A	A	A	155	45	18.75	A											P							A		A		P							T Cru	P	pos	pos			p	*T.ton*
18519	22	M	MECH	av	UL	3	UM	OTC		A	1	P	P	A	A	A	A	156	50	20.57	A													P			P		P		B	P							P	T Cor+T ungium	P	pos					
18613	32	M	farm	Po	UL	2	O+T	OTC	1y	A	1	P	P	P	A	A	A	161	66	25.48	A		P			P	P	P				P							P		C	P	P		P					T Cor+T Cru+T fac	P	pos	pos		p	p	*T.men*
18615	30	F	HM	Po	UM	57	O+T	OTC		A	1	A	P	P	A	A	A	160	53	20.7	A										P								P		B		p							T Cru	A						
18415	28	M	farm	av	LM	2	UM	GP		A	1	A	A	A	A	A	A	162	51	19.46	P								P			P							P		B	P	P							T Cor+T Cru	P	pos	pos	p	p	p	*T.ton*
12811	22	M	stu	av	UL	5	OM	GP		P	1	A	P	P	A	A	A	158	66	26.5	A		P																A		A				P					T fac	P	pos	pos		p	p	*T.rub*
12432	60	M	farm	G	UM	1	O+T	OTC		P	2	P	A	A	A	A	A	160	58	22.65	A											P							P		A		P							T Cru	P						
12306	17	M	stu	G	UL	5	UM	GP		A	1	A	P	P	A	A	A	158	64	25.7	A									P	P	P							P		B	P	P							T Cor+T Cru	A						
8690	35	F	HM	G	LM	3	O+T	OTC		A	1	A	P	A	A	P	A	151	56	24.56	A						P				P	P							P		B	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.ton*
7780	39	M	T	av	LM	5	O+T	GP	3m	A	2	A	A	A	A	A	A	151	62	27.19	A													P	P				A		B	P						P		T Cor+T man	P	pos	pos	p	p	p	*T.men*
6694	17	M	stu	Po	LM	2	UM	GP		P	2	P	P	A	A	P	A	159	56	22.22	A											P							P		A		P							T Cru	P						
477283	67	M	RETD	av	UL	1	O+T	OTC		P	1	A	A	P	A	A	A	161	64	24.71	A							P	P	P		P							A		C	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.rub*
463822	26	M	Dri	Po	UL	1.5	O+T	OTC		A	1	A	P	A	A	A	A	163	66	24.9	A																P		P		A								P	T ung	P	pos	pos		p	p	*T.men*
459411	70	M		av	UM	2	UM	GP		A	3	A	A	P	A	A	A	162	66	25.19	A		P			P		P			P	P				P			A		C	P	P		P		P			T Cor+T Cru+T fac+T ped	P	pos	pos		p	p	*T.men*
455498	10	F	stu	Po	UM	5.5	O+T	der		P	1	P	A	A	A	A	A	136	35	19.02	A					P						P							P		C	P	P							T Cor+T Cru	P						
455385	30	F	HM	av	UM	6	UM	der	3m	P	2	A	P	A	A	A	A	152	47	20.34	A		P																P		B				P					T fac	P	pos	pos	p	p	p	*T.rub*
453961	51	M	farm	Po	UL	4	O+T	OTC		A	1	P	A	A	A	A	A	160	56	21.87	A											P							A		A		P							T Cru	A						
452303	22	M	farm	av	UM	2.5	UM	OTC		P	1	A	A	A	A	A	A	161	59	22.77	A				p	p						p							P		C	P	P							T Cor+T Cru	P	pos	pos	p		p	*T.men*
449087	14	F	stu	G	LM	1	NIL			A	1	A	A	A	A	A	A	145	40	19.04	A								P					P					A		B	P								T Cor	P						
445519	12	M	stu	G	LM	2	O+T	GP	1y	P	1	A	A	A	A	A	A	141	38	19.19	A							P			P	P							P		C	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.men*
443840	42	F	farm	av	UL	2.5	UM	OTC		P	1	A	P	P	A	A	A	155	55	22.9	A								P		P	P		P					A		C	P	P							T Cor+T Cru	P						
443710	35	M	farm	Po	UM	3.5	O+T	der		P	1	P	A	P	A	A	A	164	56	20.89	A		P																P		A				P					T fac	P	pos	pos		p	p	*T.rub*
443449	21	M	stu	Po	LM	2.5	O+T	OTC		A	1	A	P	A	A	A	A	161	72	27.79	A					P			P	P									P		C	p								T Cor	P						
441627	20	F	stu	av	LM	3	O+T	OTC		P	1	A	P	P	A	A	A	155	68	28.33	P										P	P		P					A	T.pi	B	P	P							T Cor+T Cru	P	pos	pos	p	p	p	*T.men*

439199	27	M	BUSINESS	Po	UM	1	UM	der	6m	P	1	P	P	A	A	A	A	160	48	18.75	A								P										P		B	P								T Cor	P	pos	pos		p	p	*T.men*
438092	16	M	stu	G	UL	0.5	O+T	GP		A	1	A	P	A	A	A	A	170	62	21.45	A								P			P							P		B	P	P							T Cor+T Cru	P	pos					
437164	19	M	stu	G	LM	15	UM	GP		P	1	A	P	P	A	A	A	152	42	18.18	A		P					P											A		C	P			P					T Cor+T fac	P	pos	pos		p	p	*T.rub*
433646	48	M	farm	G	LM	2	O+T	OTC		A	1	A	A	P	A	A	A	160	56	21.87	A								P		P	P							A		B	P	P							T Cor+T Cru	A	pos	pos	p	p	p	*T.men*
431080	21	F	stu	G	UM	3	UM	OTC		P	1	A	A	A	A	A	A	156	53	21.81	P					P		P				P							P		C	P	P							T Cor+T Cru	P						
429178	26	F	HM	Po	UL	3.5	UM	GP	1y	P	1	P	A	A	A	A	A	170	68	23.52	A											P							P		A		P							T Cru	P	pos	pos		p	p	*T.men*
428348	42	M	farm	Po	UL	1.2	O+T	OTC		A	1	A	A	A	A	A	A	164	56	20.89	A											P							A		A		P							T Cru	P	pos	pos		p	p	*T.men*
9403	5	F		G	UL	2.3	UM	GP		A	1	A	A	A	A	A	A	105	20	18.18	A	P																	P		A					P				T cap	P	pos	pos			p	*T.rub*
7833	17	M	stu	G	UM	2	O+T	OTC		A	1	P	P	A	A	A	A	166	56	20.36	A		P			P				P	P	P	P						P		C	P	P		P		P			T Cor+T Cru+T fac+T ped	A	pos	pos		p	p	*T.rub*
4927	2	F		G	LM	5	O+T	OTC		A	1	A	A	A	A	A	A	85	16	22.4	A	P																	A		A					P				T cap	P	pos	pos		p	p	*T.rub*
3779	54	M	farm	G	LM	9	O+T	GP	3m	P	2	P	P	A	A	A	A	162	66	25.19	A		P									P							P		B		P		P					T Cru+T fac	P						
1394	31	M	A Dri	Po	UM	6	UM	OTC		P	1	P	A	P	A	A	A	158	64	25.7	A					P	P		P					P					P		C	P								T Cor	P	pos	pos	p	p	p	*T.ton*
2301	22	M	stu	G	UL	6.5	O+T	OTC		A	1	A	P	P	A	A	A	150	42	18.66	A																P		A		A								P	T ung	P						
20	55	M	farm	G	LM	2	O+T	OTC		A	2	A	A	P	A	A	A	155	53	22.08	A							P	P	P		P	P						P		C	P	P				P			T Cor+T Cru+T ped	P	pos	pos		p	p	*T.men*
479154	36	M	Dri	av	LM	1	NIL			P	2	P	P	A	A	A	A	163	53	20	A											P							A		A	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.rub*
474877	60	M	farm	av	UM	3	O+T	der		A	1	A	A	P	A	A	A	156	60	24.69	A		P		P	P													P		B	P			P					T Cor+T fac	P	pos	pos	p	p	p	*T.men*
465490	26	F	HM	Po	UL	3.5	UM	OTC		A	1	A	P	A	A	A	A	152	54	23.37	A									P									P		B	P								T Cor	P						
144671	36	M	A Dri	av	UL	2.5	O+T	OTC		P	1	A	P	P	A	A	A	150	40	17.77	P		P								P	P							P		B	P	P		P					T Cor+T Cru +T fac	P	pos	pos	p	p	p	*T.rub*
144648	40	F	farm	Po	LM	6	O+T	GP		A	1	A	A	P	A	A	A	155	68	28.33	A								P	P					P				A		C	P						P		T Cor + T man	P	pos	pos		p	p	*T.ton*
145305	23	F	stu	Po	LM	1.5	UM	GP		A	2	A	P	P	A	A	A	152	66	28.57	A											P							P		A		P							T Cru	P						
145157	38	F	HM	av	LM	2.5	O+T	GP		P	2	P	P	A	A	A	A	152	52	22.51	A										P						P		A		B	P							P	T Cor+T ungium	P	pos	pos		p	p	*T.men*
148275	42	F	HM	av	UM	3	OM	OTC	6m	A	1	A	P	P	A	A	A	158	63	25.3	A															P			P		A						P			T ped	P						
148896	26	M	stu	Po	UM	2.5	UM	OTC		A	1	A	P	P	A	A	A	160	63	24.6	A							P	P			P							A		B	P	P							T Cor+T Cru	A	pos	pos	p	p	p	*T.men*
148398	16	M	stu	av	UM	3	O+T	GP		A	1	P	P	A	A	A	A	152	38	16.45	P		P		P						P	P							P		C	P	P		P					T Cor+T Cru+T fac	P						
148155	11	M	stu	av	UM	6.5	O+T	GP		A	1	A	A	P	A	A	A	140	62	31.63	A										P								A		B	P								T Cor	P	pos					*T.ton*
148691	42	M	farm	G	UL	9	UM	OTC		P	1	A	A	A	A	A	A	154	60	25.31	A														P	P			P		A						P	P		T pedia+T man	A						
146604	58	M	farm	av	LM	1.5	UM	OTC		P	3	P	A	P	A	A	P	160	64	25	A		P					P		P		P							P	ez	C	P	P		P					T Cor+T Cru+T fac	P	pos	pos		p	p	*T.men*
146611	71	M		Po	UM	3	O+T	OTC		A	1	A	A	P	A	A	A	156	53	21.81	A		P						P										A		B	P			P					T Cor+T fac	A						
146648	37	M	T	av	LM	5	O+T	GP	3m	A	1	A	A	P	A	A	A	158	63	25.3	A											P							P		B		P						P	T Cru+T ungium	P	pos	pos		p	p	*T.rub*

146593	35	F	HM	av	LM	3.5	O+T	OTC		A	1	A	P	A	A	A	A	170	70	24.22	A																P		P		A								p	T ung	P	pos	pos	p	p	p	*T.men*
146454	48	M	farm	av	UM	1.5	O+T	GP		P	2	A	A	A	A	A	A	162	65	24.8	A							P		P	P	P							P		C	P	P							T Cor+T Cru	A						
144880	28	F	HM	G	UL	2.5	O+T	OTC		A	1	A	P	A	A	A	A	176	78	37.32	A		P		P						P	P							P		C	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.rub*
144273	27	M	stu	Po	UL	1.5	UM	GP		P	2	A	P	A	A	A	A	162	68	25.95	A					P	P												A		B	P								T Cor	P	pos	pos		p	p	*T.ton*
144349	54	M	farm	av	LM	1	NIL			A	1	P	A	P	A	A	A	168	74	26.24	A							P			P	P							A		B	P	P							T Cor+T Cru	P						
144501	39	M	Dri	Po	UL	1	O+T	GP	1y	A	1	A	P	P	A	A	A	160	58	22.65	A											P							P		B		P							T Cru	P	pos	pos	p	p	p	*M.can*
145046	64	M	RETD	Po	LM	2.5	O+T	OTC		A	1	A	A	A	A	A	A	172	68	23.05	A							P				P							A		B	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.men*
144349	54	M	SK	av	LM	2	UM	OTC		A	2	A	A	A	A	A	A	163	72	27.16	A									P			P						P		B	P								T Cor	P						
477342	20	F	HM	av	LM	3	O+T	OTC	3m	P	1	A	P	P	A	A	A	160	65	25.39	A		P			P						P							P		C	P	P		P					T Cor+T fac	A						
2238	56	M	T	G	LM	3.5	O+T	OTC		A	1	A	A	A	A	A	A	158	54	21.68	A										P	P							A		B	P	P							T Cor+T Cru	P	pos	pos	p	p	p	*T.men*
52238	60	M	farm	av	UM	6	UM	der	3m	preset	1	A	A	A	A	A	A	170	70	24.22	A			P		P		P			P			P	P				P		C	P					P	P		T Cor+T pedia+T man	P						
49112	23	M	stu	G	UM	0.5	O+T	OTC		A	2	A	P	P	A	A	A	166	65	23.63	A										P								P		B	P								T Cor	P	pos	pos		P		*T.rub*
62706	38	M	Dri	av	LM	0.5	UM	OTC		P	2	P	P	A	A	A	A	155	58	24.16	A								P	P		P							P		C	P	P							T Cor+T Cru	P						
64040	18	M	stu	av	UL	2.5	O+T	OTC		P	2	A	P	A	A	A	A	163	62	23.39	A						p	P				P							A	T.pi	C	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.rub*
94193	60	M	UE	av	UM	2	O+T	OTC	6m	A	1	A	A	P	A	A	A	170	66	22.83	A					P				P									A		B	P								T Cor	A						
93151	23	M	stu	G	UM	6	O+T	GP		A	1	A	P	A	A	A	A	156	64	26.33	A		P						P		P	P							P		C	P	P		P					T Cor+T Cru+T fac	P	pos	pos		p	p	*T.rub*
92813	49	M	farm	Po	LM	3	UM	GP		P	2	P	A	P	A	A	A	168	68	24.11	A							P			P	P							P		B	P	P							T Cor+T Cru	P	pos	pos		P	p	*T.rub*
90688	35	F	farm	av	UL	5.5	O+T	OTC		A	1	A	A	A	A	A	A	150	52	23.1111	A					P									P				P		B	P						P		T Cor+T man	A						
94710	26	F	HM	Po	UM	3	UM	GP		A	2	A	P	A	A	A	A	156	60	24.69	A											P							A		A		P							T Cru	A	pos	pos		p	p	*T.men*
96211	47	M	farm	av	LM	2.5	NIL			A	1	A	A	A	A	A	A	160	63	24.6	A		P		P			P	P		P								A		C	P			P					T Cor+T fac	P	pos	pos		p		*T.ton*
102597	34	M	MECH	G	LM	3	UM	GP		A	1	A	A	A	A	A	A	173	62	20.73	A					P	p					P							P		B	P	P							T Cor+T Cru	P						
102417	55	F	farm	av	UM	2.5	O+T	GP	6m	A	2	P	P	A	A	A	A	152	54	23.37	A							P		P		P							A		C	P	P							T Cor+T Cru	P	pos	pos		p	p	*M.can*
102408	35	F	farm	Po	UL	2	NIL		1y	A	1	A	P	A	A	A	A	160	55	21.48	A																P		A		A								P	T ung	A	pos					
103976	24	M	farm	av	LM	3	UM	OTC		A	1	A	A	A	A	A	A	152	50	21.64	A										P	P							P		B	P	P							T Cor+T Cru	P						
76042	31	M	Dri	G	LM	5	O+T	OTC		P	1	A	A	A	A	A	A	164	58	21.64	A		P		P							P							A		C	P	P		P					T Cor+T Cru+T fac	P	pos	pos	p	p	p	*T.ton*
75146	49	M	farm	av	UM	0.5	UM	GP		A	1	P	P	P	A	A	A	155	48	20	A		P							P									P		B	P			P					T Cor+T fac	P	pos	pos		p	p	*T.men*
73088	35	M	farm	av	UL	3.5	O+T	OTC		A	1	A	A	A	A	A	A	152	52	20.88	A											P							P	ez	A		P							T Cru	A						
71521	27	M	Dri	G	UL	3.5	UM	OTC	6m	A	3	A	P	A	A	A	A	151	55	24.12	A			P				P											P		B	P								T Cor	P	pos	pos		p	p	*T.rub*
70020	55	F	farm	av	LM	1.5	O+T	GP		P	1	A	P	A	A	A	A	153	56	23.93	A							P	P										A		B	P								T Cor	A	pos	pos		p		*T.rub*

61108	8	M	stu	G	UL	2	O+T	GP		P	2	A	A	P	A	A	A	140	40	20.4	A	P																	P		A					P				T cap	A						
61088	38	F	HM	av	UL	2	O+T	OTC		A	1	P	P	P	A	A	A	152	52	22.51	P								P			P							P		B	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.men*
60772	20	M	stu	G	LM	3	O+T	GP	1y	A	1	A	P	A	A	A	A	154	55	23.2	A							P		P	P		P						P	T.pi	C	P					P			T Cor+T ped	A						
60069	3	M		av	UL	6.5	O+T	OTC		A	1	A	A	A	A	A	A	94	15	17.04	A	P																	A	T.pi	A					P				T cap	P	pos	pos	p	p	p	*T.ton*
59675	11	M	stu	Po	LM	2.5	O+T	GP	3m	A	1	A	A	P	A	A	A	136	35	19	A	P																	P		A					P				T cap	P	pos	pos	p	p	p	*T.rub*
59565	34	M	farm	av	LM	2.5	UM	OTC		A	1	A	P	A	A	A	A	162	60	22.9	A										P	P							P		B	P	P							T Cor+T Cru	P						
58635	16	M	stu	Po	UL	1.5	O+T	GP		A	1	A	P	A	A	A	A	161	42	16.21	A											P							P		B		P							T Cru	A						
57542	18	F	stu	av	UM	12	UM	GP		A	1	A	A	P	A	A	A	156	50	20.57	P							P											A		B	P								T Cor	P	pos	pos	p	p	p	*T.rub*
57084	22	F	HM	G	LM	9	O+T	GP		A	1	P	A	P	A	A	A	157	53	21.54	A								P			P							A		B	P	P							T Cor+.T Cru	A	pos	pos		p	p	*T.ton*
56569	40	F	HM	av	LM	1.5	O+T	OTC		A	1	A	A	A	A	A	A	155	55	22.91	A		P																P		A				P					T fac	P						
45137	70	M		Po	LM	2.5	O+T	OTC	6m	A	2	A	A	A	A	A	A	162	60	22.9	A											P							P		B		P							T Cru	P						
45125	40	M	BUSI	av	UL	3.5	O+T	GP		A	2	P	A	P	A	A	A	155	52	21.66	A									P	P	P							A		C	P	P							T Cor+T Cru	P	pos	pos	p	p	p	*T.men*
45132	27	F	HM	av	LM	6	O+T	GP		A	2	A	P	A	A	A	A	150	57	25.33	A						P				P	P							P	T.pi	C	P	P							T Cor+T Cru	P	pos	pos		p	p	*M.can*
44914	50	M	BUSI	Po	LM	5.5	UM	OTC		A	1	A	A	A	A	A	A	159	60	23.8	A													P	P				A		B	P						P		T Cor+T man	A						
28413	55	M	farm	av	UM	1.5	O+T	GP	3m	P	1	A	A	A	A	A	A	155	50	20.83	A											P							P		B		P							T Cru	P	pos	pos		p	p	*T.rub*
15925	55	M	farm	G	UM	1.5	O+T	GP		A	1	A	A	P	A	A	A	163	52	19.62	A							P	P	P		P							P		C	P	P							T Cor+T Cru	P	pos	pos	p	p	p	*T.ton*
14165	31	M	Dri	av	UL	3.5	O+T	GP		A	1	A	P	P	A	A	A	162	56	21.37	A																P		A		A								P	T ung	A	pos	pos	p	p	p	*T.men*
12163	48	M	farm	Po	LM	2.5	UM	OTC	3m	A	2	A	A	A	A	A	A	161	59	22.77	A		P			P		P			P	P				P			P		C	P	P		P					T Cor+T Cru+T fac	P	pos	pos		p	p	*T.rub*
107189	19	M	stu	av	LM	6	O+T	OTC		A	1	A	P	A	A	A	A	155	58	24.16	A					P						P							P		B	P	P							T Cor+T Cru	P						
112616	43	M	MECH	Po	UL	9	O+T	GP		A	1	A	A	P	A	A	A	160	55	21.48	A		P		P														A		C	P			P					T Cor+T fac	A	pos	pos		p	p	*T.rub*
112163	27	F	HM	av	UM	12	UM	OTC		P	1	A	A	P	A	A	A	170	69	23.87	P											P							P		A		P							T Cru	P	pos	pos	p	p	p	*T.men*
115397	35	F	farm	av	LM	9	O+T	GP		A	1	A	A	A	A	A	A	152	45	19.48	A				p	p						p							P		C	P	P							T Cor+T Cru	P						
115439	32	F	HM	G	LM	9	UM	OTC		A	1	A	A	P	A	A	A	160	56	21.87	A								P					P					A		B	P								T Cor	P						
113340	36	M	SK	av	LM	3	O+T	GP		A	1	A	A	A	A	A	A	156	52	21.39	A							P			P	P							A		B	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.rub*
115616	50	M	farm	Po	UL	3.5	UM	GP	1y	A	2	P	A	P	A	A	A	170	67	23.18	A								P		P	P		P					P		C	P	P							T Cor+T Cru	P	pos	pos		p	p	*T.rub*
55309	10	M	stu	av	UM	6.5	O+T	OTC		A	1	A	A	A	A	A	A	133	66	37.5	A		P																P		A				P					T fac	P	pos					
117217	28	M	Dri	G	UL	3	O+T	OTC		A	1	A	P	P	A	A	A	105	45	40.9	P					P			P	P									A		C	P								T Cor	P	pos	pos	p	p	p	*T.rub*
67246	38	F	HM	av	LM	5.5	UM	GP		A	1	P	A	P	A	A	A	166	52	18.9	A										P	P		P					P		B	P	P							T Cor+T Cru	A	pos	pos		p	p	*T.men*
105708	37	F	HM	Po	LM	6	O+T	OTC	6m	A	2	A	A	A	A	A	A	175	58	18.95	A								P										P		B	P								T Cor	P						

59164	19	F	stu	av	LM	2	UM	GP	1y	A	1	A	P	P	A	A	A	162	40	15.26	P								P			P							A		B	P	P							T Cor+T Cru	A						
62667	45	M	farm	av	UL	4.5	O+T	GP		A	1	P	A	A	A	A	A	158	60	24.09	A		P					P											A		C	P			P					T Cor+T fac	P	pos	pos		p	p	*T.rub*
55288	60	M	farm	Po	UL	3.5	UM	GP		A	2	A	A	A	A	A	A	152	55	23.8	A								P		P	P							P		C	P	P							T Cor+T Cru	A						
131707	18	F	stu	Po	UM	2.5	O+T	OTC		A	1	A	P	A	A	A	A	155	41	17.08	A					P		P				P							P		C	P	P							T Cor+T Cru	P	pos	pos	p	p	p	*T.men*
125172	20	F	HM	G	UM	6.5	O+T	OTC		P	1	A	A	P	A	A	A	153	45	19.23	A							P			P								P		B	P								T Cor	P	pos	pos		p	p	*T.men*
123936	42	F	farm	av	UL	2	O+T	OTC		P	1	P	P	P	A	A	A	156	60	24.69	A								P	P				P					A		B	P								T Cor	P						
175307	15	F	stu	av	LM	1	O+T	GP		P	1	P	A	A	A	A	A	152	40	17.3	A					P		P			P								P		C	P								T Cor	P	pos	pos		p	p	*T.rub*
172257	62	F	HM	Po	LM	1	NIL			A	2	A	P	P	A	A	A	150	62	27.55	A											P							A		B		P							T Cru	P	pos	pos		p	p	*T.ton*
254810	37	M	farm	G	UM	2.5	O+T	OTC		A	1	A	P	A	A	A	A	160	56	21.87	A					P		P						P					P		C	P								T Cor	P						
293107	29	M	Dri	av	UL	3	O+T	OTC	1y	P	1	A	P	P	A	A	A	162	51	19.46	A											P							A		A		P							T Cru	P	pos	pos	p	p	p	*T.men*
272363	28	M	MECH	av	UL	6	UM	der		A	2	A	A	A	A	A	A	152	55	23.8	P									P		P				P			P		B	P	P				P			T Cor+T Cru+T ped	P	pos	pos		p	p	*T.rub*
130436	34	M	PM	Po	LM	2.5	O+T	OTC		A	2	A	A	P	A	A	A	170	58	20.06	A											P							A		B		P							T Cru	A	pos	pos		p	p	*T.men*
259790	35	F	farm	G	UL	3	UM	OTC	3m	P	2	P	A	A	A	A	A	152	60	25.97	A						P	P											P		C	P								T Cor	P						
152510	45	F	HM	G	LM	12	O+T	OTC	1y	A	2	P	P	A	A	A	A	158	58	23.29	A		P								P	P							A		C	P	P		P					T Cor+T Cru+T fac	A	pos	pos	p	p	p	*T.rub*
157053	40	F	HM	av	LM	18	UM	GP		P	1	A	P	P	A	A	A	162	60	22.9	A													P	P				P		B	P						P		T Cor+T man	P	pos	pos		p	p	*T.men*