

## A CROSS-SECTIONAL SURVEY ON THE PREVALENCE AND AWARENESS OF TINEA VERSICOLOR AMONG THE PARAMAEDICAL STUDENTS

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### ABSTRACT

Tinea versicolor is a common superficial fungal infection caused by the overgrowth of *Malassezia* species, which are part of the normal skin flora. It is characterized by hypopigmented or hyperpigmented patches, commonly affecting the trunk and upper limbs. Despite being non-contagious and easily treatable, tinea versicolor is frequently misinterpreted as simple white spots or vitamin deficiency, leading to delayed diagnosis and recurrence. The present study aimed to assess the **prevalence, awareness, associated risk factors, affected rate and treatment-seeking behavior** related to tinea versicolor among the paramedical students. A cross-sectional survey was conducted using a structured, self-administered questionnaire among **[135] participants** from diverse age groups. The questionnaire collected information on demographic

characteristics, presence and duration of skin discoloration, associated symptoms, predisposing factors such as excessive sweating and climatic exposure, personal hygiene practices, awareness of fungal infections, and treatment approaches. Data was analyzed using descriptive statistical methods. The findings revealed a higher prevalence of tinea versicolor among **adolescents and young adults**, particularly in individuals exposed to **hot and humid environmental conditions**. Excessive sweating and oily skin were identified as major contributing factors. A considerable proportion of participants lacked adequate awareness regarding the fungal etiology of the condition and often confused it with general white spots or nutritional deficiencies. Although antifungal therapy was reported to be effective, recurrence was common, mainly due to incomplete treatment and lack of preventive

measures. The study highlights the **significant prevalence and poor awareness** of tinea versicolor among the population. Educational initiatives focusing on early recognition, correct diagnosis, and adherence to antifungal treatment are essential to reduce recurrence and improve overall skin health outcomes.

**KEYWORDS:** Tinea versicolor, *Malassezia*, White spots, Survey study, Fungal skin infection, Awareness.

## INTRODUCTION



Tinea versicolor, also referred to as pityriasis versicolor, is a prevalent superficial mycotic infection that affects the outermost layer of the skin, the stratum corneum. The condition is caused by the lipophilic dimorphic yeast *Malassezia furfur*, an opportunistic member of the normal human cutaneous microbiota. Under physiological conditions, *Malassezia* species exist harmlessly on the skin; however, certain environmental and host-related factors can trigger fungal overgrowth and pathogenic transition. Warm temperatures, high humidity, excessive sweating, sebaceous hyperactivity, occlusive clothing, hormonal fluctuations, and immunocompromised states are recognized contributors to disease manifestation, explaining its increased incidence in tropical and subtropical regions, including South Asia.

Clinically, tinea versicolor is characterized by well-defined hypo- or hyperpigmented macules or patches, often accompanied by fine branny scaling and occasional mild pruritus. Lesions commonly involve sebaceous-rich areas such as the chest, upper back, neck, shoulders, and upper arms, and may coalesce into larger irregular plaques. The pigmentation changes arise due to fungal metabolites, including dicarboxylic acids like azelaic acids which interfere with melanin synthesis and melanocyte function, leading to visible discoloration, particularly after ultraviolet (UV) exposure when affected areas fail to tan normally.

Based on lesion appearance, the disease is broadly classified into hypo-pigmented, hyper-pigmented, housemasters, mixed, and funicular variants, each reflecting differences in host skin tone, inflammatory response, and funicular involvement. Although benign and non-contagious, tinea varicolor often causes cosmetic distress, recurrent episodes, and psychosocial impact, underscoring the need for effective management strategies and continued clinical research.

## **CLASSIFICATION BASED ON PIGMENTATION AND MORPHOLOGY**

### **HYPOPIGMENTED TYPE**

Presents as light-colored or depigmented patches (off-white to pale).

More noticeable in individuals with darker skin tones.

This is caused by fungal metabolites that inhibit melanin production, preventing normal tanning.

### **Hyperpigmented type**

Appears as brown to dark-colored macules or patches.

Common in people with lighter skin tones.

Results from localized stimulation or uneven distribution of melanin due to fungal activity.

### **Clinical Presentation**

Lesions appear as well-defined or ill-defined hypopigmented macules and patches, distributed over the chest, back, shoulders, and proximal upper limbs. These lesions may coalesce to form larger areas with irregular borders. Fine branny scaling becomes evident upon gentle scraping (evoking the “evoked scale sign” or scratch sign).

### **Pathogenesis**

The hypopigmentation is primarily attributed to the production of dicarboxylic acids such as azelaic acid by *Malassezia*, which inhibits tyrosinase activity and interferes with melanin synthesis. Additionally, structural damage to melanocytes and altered melanosome transfer contribute to pigmentary changes.

### **Clinical Significance**

This form is often more noticeable in individuals with darker skin tones, leading to cosmetic concerns and psychological distress.

**HYPERPIGMENTED TYPE**

The hyperpigmented form is less common but clinically important due to its resemblance to other pigmentary disorders.

**Clinical Presentation**

Patients exhibit hyperpigmented macules or patches ranging from light brown to dark brown. The lesions are typically found in seborrheic areas and may demonstrate mild scaling.

**Pathogenesis**

The mechanism involves increased melanin production, possible due to inflammatory stimulation of melanocytes or thickening of the stratum corneum, which alters light reflection. In some cases, enlargement of melanosomes has also been observing.

**Differential Diagnosis**

This variant may mimic conditions such as melasma, post-inflammatory hyperpigmentation, and certain dermatoses, necessitating careful clinical evaluation.

**ERYTHEMATOUS (INFLAMMATORY) TYPE**

Characterized by pink, red, or salmon-colored lesions.

May include mild itching and inflammation.

Reflects a stronger host immune or inflammatory response rather than pigment alteration alone.

**Clinical Presentation**

Lesions appear as erythematous to pinkish macules or patches with fine scaling. Patients may report mild pruritus or a burning sensation. The lesions can resemble inflammatory dermatoses such as seborrheic dermatitis or dermatophytosis.

**Pathogenesis**

This type results from an enhanced host immune response, leading to

Vasodilation of superficial dermal blood vessels

Release of inflammatory mediators

Recruitment of immune cells

These processes contribute to erythema and associated symptoms.

Clinical Importance

Due to its inflammatory nature, this type is more likely to be misdiagnosed, potentially leading to inappropriate treatment.

### **MIXED TYPE**

Shows a combination of hypo- and hyperpigmented lesions in the same individual.

Frequently observed in tropical climates, where recurrent infection and sun exposure create varied pigmentation patterns.

### **Clinical Presentation**

A mixture of hypopigmented, hyperpigmented, and erythematous lesions may be observed in the same individual. The distribution is often widespread and asymmetrical.

### **Clinical Relevance**

The mixed presentation reflects the dynamic interaction between fungal proliferation, host immune response, and environmental factors such as humidity and sweating.

### **FOLLICULAR TYPE**

Involves individual hair follicles, producing small, monomorphic perifollicular papules or spots. More common on the chest and back, especially in young adults with oily or sweaty skin.

Less Common but Recognized Clinical Variants.

### **Clinical Presentation**

Characterized by folliculocentric papules with fine scaling, this type may resemble bacterial folliculitis or acneiform eruptions.

### **Pathogenesis**

The organism localizes around hair follicles, leading to inflammation and scaling in follicular units.

### **ATROPHIC TYPE**

The atrophic form is extremely rare and typically associated with chronic or long-standing disease.

### **Clinical Presentation**

Lesions show localized skin thinning, appearing as depressed or wrinkled patches.

### **Clinical Significance**

This variant may be associated with prolonged infection or inappropriate use of topical corticosteroids.

### **INVERSE (INTERTRIGINOUS) TYPE**

Occurs in skin folds (axilla, groin, inframammary region).

Less scaly due to moist, occluded environment.

Often underdiagnosed because of atypical site involvement.

### **CONFLUENT TYPE**

Multiple lesions merge into large irregular patches or plaques.

Prominent scaling may be seen.

Mostly affects the upper trunk.

### **CAUSES OF TINEA VERSICOLOR**

Tinea versicolor is caused by the overgrowth of lipophilic yeast belonging to the genus *Malassezia*, primarily *Malassezia furfur*, though other species such as *M. globosa* and *M. sympodialis* is also implicated. These yeasts are part of the normal skin microbiota and remain non-pathogenic until triggered by favorable conditions that promote conversion to a pathogenic mycelial form.

The major causes are broadly categorized into environmental and host-related factors. Hot and humid climate is the strongest external contributor, as moisture and heat enhance fungal proliferation. Additional environmental triggers include excessive sweating, occlusive or synthetic clothing, high ambient temperature, and prolonged sun exposure, which increases contrast in affected lesions.



Host factors play a central role in disease development. Sebaceous gland hyperactivity and oily skin provide essential lipids required for yeast growth. Hormonal changes during

puberty, pregnancy, or steroid imbalance increase susceptibility. Immunosuppression due to diabetes, corticosteroid therapy, organ transplantation, or systemic illness weakens cutaneous defense, enabling yeast over colonization. Other contributors include genetic predisposition, malnutrition, and altered skin barrier function. These combined factors disturb the equilibrium between host and fungus, leading to the characteristic pigmentary and scaly lesions of tinea versicolor.

### **Hormonal change**

The development of tinea versicolor by influencing sebaceous gland activity and altering the skin microenvironment. Additionally, **immunosuppression**, whether due to underlying diseases or medications such as corticosteroids, can reduce the body's ability to control the proliferation of the yeast.

### **Other contributing factors include**

Genetic predisposition

Poor hygiene

Use of oily cosmetic products, malnutrition

prolonged use of occlusive clothing

### **DIAGNOSIS**

The outstanding clinical feature of tinea versicolor is patches of whitish skin—a partial leukoderma. Closer examination reveals a fine scale that can be “brought out” by gently scraping the involved skin with a scalpel blade. The scale is limited to the area of leukoderma. Alternatively, the infection may present as a tan or fawn-colored scale that can be similarly “raised up.” This uniform fine scaling characteristic of tinea versicolor is rarely found in other forms of tinea or seborrheic dermatitis. Vitiligo can be ruled out because, whereas tinea versicolor is a partial leukoderma, vitiligo is complete and scaling is absent. Wood’s light produces a yellow fluorescence in one third of cases but is not necessary for diagnosis.<sup>7</sup> The organism resides principally in the stratum coecum and can be conveniently removed for identification purposes by scraping the skin lightly or stripping it using cellophane tape. Then, a simple, inexpensive test, the potassium hydroxide (KOH) preparation, can be used to confirm the presence of the organism. Scales can be easily examined using special staining techniques,<sup>8</sup> and morphologic characteristics usually permit a definitive diagnosis.

The leukoderma of tinea versicolor is due to the inhibitory effect of the organism on pigmentation and tanning. The presence of the active scale acts like a cover on the skin limiting the degree of tanning that can occur. When the scale is removed, the occluded area is white and remains so, even after successful therapy, until the skin is retained or the surrounding tanned skin “wears off” months later. The condition truly produces a “spotty body.”

## TREATMENT

A wide range of antifungal drugs has been shown to be effective in the treatment of tinea versicolor.<sup>9</sup> In a broad sense, all these medications are at least transiently “effective” if used appropriately, and follow-up evaluation is limited to only a 2- to 6- week period. Some of the agents are far more effective in producing prolonged cures. Although several of these agents are not currently approved in the United States for the treatment of tinea versicolor, they serve as a basis for discussion about current and past therapeutic strategies and the development of future treatments.

### Traditional Topical

Traditionally, the most frequently used topical treatment has been a 2.5% selenium sulfide shampoo applied once a day, usually after showering, over the entire affected area. It is washed off after 10 minutes. Alternatively, the shampoo can be applied, left overnight, and washed off the following morning. Typically, treatment is continued for 7 to 14 days or longer, sometimes indefinitely. All the topical “-azoles,” including econazole nitrate, ciclopirox olamine, and oxiconazole nitrate, appear to be equally effective in the treatment of tinea versicolor, although none has been studied as thoroughly as ketoconazole cream. In one study, application of a 2% ketoconazole cream from the neck to the knees produced clearing in 98% of the 51 treated patients, compared with a response in 28% of the 50 patients who received placebo.<sup>11</sup> The overall mycologic cure rate was 84% in the ketoconazole group and 10% in the placebo group. In follow up, 80% of treated patients remained clear after 1 year and 33% were still clear 2 years later.



### Systemic Agents

Ketoconazole An early double-blind study of oral ketoconazole at doses of 200 mg/day for 4 weeks demonstrated complete healing in 97% of patients.<sup>12</sup> Only 9% of patients in the placebo group responded. Following up 1 year later it showed that 64% remained clear. These findings compare favorably with a recurrence rate of 89% with casual use of miconazole nitrate. <sup>12</sup> Multiple open and double-blind studies of systemic ketoconazole have been conducted in various regions of the world.<sup>13</sup> The optimum dosage is 200 mg/day for 10 days. Cure rates have been high, often 90% to 100%, even in studies in which patients previously failed to respond to various topical therapies. Because the overall rate of hepatic toxicity with oral ketoconazole is about 1:10,000, many dermatologists are uncomfortable using this agent. The incidence of hepatotoxicity, however, has been calculated to be only 1:500,000 in patients who are receiving short-term (10-day) oral ketoconazole therapy for tinea versicolor. Oral ketoconazole is not currently approved by the Food and Drug Administration (FDA) for the treatment of tinea versicolor in the United States.

### TINEA VERSICOLOR – SYMPTOMS

Tinea versicolor is a common, superficial fungal infection of the skin caused by the overgrowth of *Malassezia* species, which are part of the normal skin flora. The condition mainly affects the outermost layer of the skin and leads to characteristic changes in skin color and texture.

### Skin Discoloration

The most prominent symptom is the appearance of discolored patches on the skin. These patches may be hypo-pigmented (white or light-colored), hyper-pigmented (brown or dark), or occasionally pinkish in color. The affected areas often fail to tan normally, making the patches more noticeable after sun exposure. The discoloration occurs because the fungus interferes with normal melanin production in the skin.

### Fine Scaling

A distinctive feature of tinea versicolor is fine, powdery scaling on the surface of the patches. This scaling may not be obvious initially but becomes apparent when the skin is gently scratched or stretched. The presence of scaling helps differentiate tinea versicolor from other causes of white spots, such as vitiligo.

### **Itching and Sensations**

Most patients experience no or mild itching, which may worsen during hot weather or excessive sweating. Pain, burning sensation, or inflammation is usually absent, indicating the superficial nature of the infection.

### **Distribution of Lesions**

The lesions are commonly found on seborrheic areas of the body where sebaceous glands are abundant. These include the chest, back, neck, shoulders, upper arms, and occasionally the face. Multiple small patches may gradually enlarge and merge, forming irregularly shaped areas of discoloration.

### **AIM**

The aim of this study is to assess the prevalence and evaluate the level of awareness regarding Tinea versicolor among the general population, including knowledge about its causes, prevention, and treatment.

### **OBJECTIVES**

- To determine the prevalence of Tinea versicolor among the general population through a cross-sectional survey.
- To assess the level of awareness regarding the causes, symptoms, and transmission of Tinea versicolor.
- To study the association between demographic factors (age, gender, occupation, and lifestyle) and the occurrence of Tinea versicolor.
- To identify preventive practices followed by individuals to reduce the risk of developing the infection.

### **LITERATURE REVIEW OF TINIEA VERSICOLOR**

#### **HISTORICAL OVERVIEW OF TINEA VERSICOLOR**

The skin condition now known as Tinea Versicolor (also called Pityriasis Versicolor) has been recognize for many centuries. Early physicians observed discoloured patches on the skin but did not initially understand the exact cause. In ancient medical texts, the condition was often grouped with other skin diseases that caused scaling and pigmentation changes.

A more scientific description emerged during the 18th and 19th centuries, when dermatology began to develop as a separate medical specialty. Physicians started classifying skin diseases based on visible symptoms and microscopic observations.

### Discovery of the Fungal Cause

The breakthrough occurred in 1846, when the German dermatologist Karl Ferdinand Eichstedt identified fungal elements in skin scrapings from patients with the disease. His work demonstrated that the condition was caused by a microorganism rather than by pigment disorders or poor hygiene, as previously believed.

Later in 1853, the French physician Charles-Philippe Robin described the fungus responsible for the infection and named it *Microspores furfur*. This discovery marked a crucial step in understanding the microbial origin of the disease.

### Development of the Malassezia Concept

In 1874, the French scientist Louis-Charles Malassez studied the yeast-like organisms present in skin lesions and recognized their role in the infection. Eventually, the organism responsible for the disease was classified under the genus *Malassezia*, which is now known to include several species such as *Malassezia globosa* and *Malassezia furfur*.

During the late 19th and early 20th centuries, researchers discovered that these yeasts are normal inhabitants of human skin but can become pathogenic under certain conditions such as humidity, excessive sweating, and increased sebum production.

### Advances in Diagnosis

In the early 20th century, microscopic examination techniques improved the diagnosis of Tinea Versicolor. The use of potassium hydroxide (KOH) preparations allowed clinicians to visualize fungal hyphae and spores, which appear as the characteristic “spaghetti and meatballs” pattern.

Later, the introduction of Wood’s lamp examination helped clinicians identify affected areas through yellow-green fluorescence in some patients.

### Modern Understanding

Recent advances in microbiology and molecular biology have significantly improved the understanding of Tinea Versicolor. Modern studies have identified multiple species of *Malassezia* and clarified their role in skin diseases. Research has also explained how fungal metabolites interfere with melanin production, leading to the characteristic pigment changes.

Today, the condition is recognized as a common superficial fungal infection, and effective treatments such as topical antifungal agents and systemic antifungal medications are widely available.

## **METHODOLOGY**

### **Study Design and Ethical Considerations**

A cross-sectional descriptive survey was conducted to assess the prevalence and awareness of Tinea Versicolor (also known as Pityriasis Versicolor) among paramedical students. This study design was selected because it allows the evaluation of disease occurrence and knowledge levels within a specific population at a single point in time.

### **Sampling Techniques and Population Demographics**

A total of 135 students participated in the study, drawn from various paramedical institutions, including SS Institute of Pharmacy, SRM University, and others. The sample included students from different academic years and fields of study (pharmacy, nursing, physiotherapy), providing a comprehensive overview of tinea versicolor knowledge among the paramedical population.

### **Development and Validation of the Questionnaire**

The questionnaire was developed based on previous studies but was modified to suit the specific demographic of paramedical students. It consisted of **20** questions covering various aspects of tinea versicolor symptoms, causes, treatments, and students' attitudes toward self-medication and traditional remedies. The questionnaire was validated by faculty members specializing in neurology and public health.

### **Statistical Tools and Data Analysis**

The responses were analyzed using descriptive statistics to calculate the percentages of students who answered each question correctly. A chi-square test was used to identify significant associations between demographic factors (such as age, academic year, and field of study) and students' knowledge of tinea versicolor. The results were then compared with existing literature to highlight gaps in knowledge and areas for improvement.

## RESULTS AND DISCUSSION

### Survey Question Breakdown

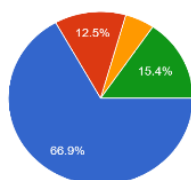
#### 1. What do you think causes tinea versicolor?

(fungal infection / others)

Fungal Infection Is the Correct Answer

The 66.9% of the peoples are choose the correct answer and known the causes of tinea versicolor. The 33.1% of peoples are don't knowledge about this causes. And choose the wrong answers.it this question is exploring the basic awareness about tinea versicolor.

4.தேம்பல் எதனால் ஏற்படுகின்றன என்று நீங்கள் நினைக்கிறீர்கள்? What do you think causes white spots?  
136 responses



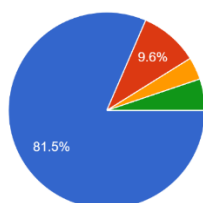
- A) பூஞ்சை தொற்று (Fungal infection)
- B) வைரஸ் தொற்று (viral infection)
- C) பாக்டீரியா தொற்று (Bacterial infection)
- D) செல் நிராகரிப்பு (Cell rejection)

#### 2. Which nutrient deficiency may sometimes lead to light tinea versicolor patches?

[vitamin B12&iron (81.5%)/others (19.5%)]

The high percentage 81.5% of students know about the deficiency of vitamin b12 can lead to tinea versicolor. His choice is a correct answer and then balance of 19.5% of students gives the wrong choice.

6.எந்த ஊட்டச்சத்து குறைபாடு சில நேரங்களில் லேசான திட்டுகளுக்கு வழிவகுக்கும்? Which nutrient deficiency may sometimes lead to light patches?  
135 responses



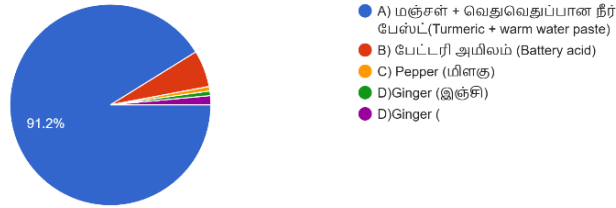
- A) வைட்டமின் பி12 / இரும்பு (Vitamin B12 / Iron)
- B) Sodium (சோடியம்)
- C) Copp sulfate (காப்பர் சல்பேட்)
- D) துத்தநாக ஆக்சைடு (Zinc oxide)

#### 3. Which natural product reduces mild fungus-related patches?

(Turmeric + warm water paste/others)

The most of students believe the turmeric paste can be able to cure the mild patches on skin. they are choosing the correct answer and the percentage is 91.2%. The less percentage of students are choosing wrong answer. The question is framed for how much people is awareness about modest home remedies can be suitable for tinea versicolor.

12.எந்த இயற்கை தயாரிப்பு வேசான பூஞ்சை தொடர்பான திட்டுகளைக் குறைக்கிறது? Which natural product reduces mild fungus-related patches?  
136 responses

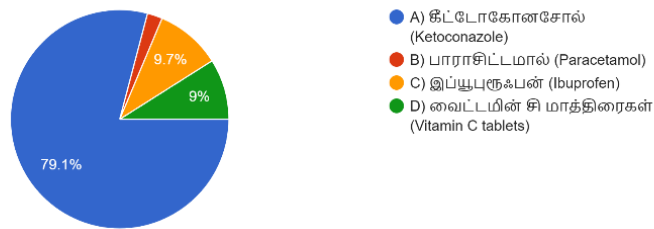


#### 4. Which medicine is commonly used for fungal infection of tinea versicolor?

(Ketoconazole/others)

This question is cleared to how much of students have the knowledge about allopathic treatment for tinea versicolor. The higher percentage 79.1% of students choose correct answer and the 20.9% of people gives wrong. The ketoconazole is treated to white patches on the skin. Most of students have some knowledge about the treatment of tinea versicolor.

16.பூஞ்சை வெள்ளைத் திட்டுகளுக்கு பொதுவாகப் பயன்படுத்தப்படும் மருந்து எது?  
Which medicine is commonly used for fungal infection of tinea versicolor?  
134 responses

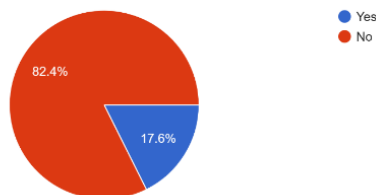


#### 5. Are you affected by this white spots?

(Yes 17.6% / No 82.4%)

The question is framed for determine the affected rate of students. The 17.6% of students affected by this tinea versicolor. And the 82.4% of people choosing a No option.

18. இந்த தேம்பலால் நீங்கள் பாதிக்கப்பட்டிருக்கிறீர்களா? Are you affected by this white spots ?  
136 responses

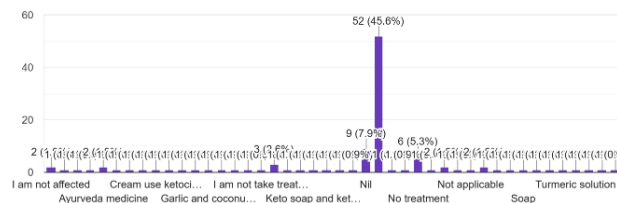


## 6. Which kind of treatment do you take during that time?

This summary explain about the affected persons are which kind of treatment taken on that time. The treatment is differed a person to person. Most of the students can use a turmeric solution, coconut, dermis 5 and ketoconazole.

19. அந்த நேரத்தில் நீங்கள் என்ன வகையான சிகிச்சையை எடுத்துக் கொண்டீர்கள்? / Which kind of treatment do you taken on that time?

114 responses



## SUMMARY AND CONCLUSION

Tinea Versicolor is a common superficial fungal infection of the skin caused by yeast of the genus *Malassezia*. It is characterized by hypo-pigmented or hyper-pigmented patches, commonly appearing on the chest, back, neck, and upper arms. The condition is more prevalent in tropical and subtropical climates where heat and humidity favor fungal growth.

This cross-sectional survey was conducted to assess the prevalence and awareness and treatment of Tinea Versicolor among paramedical students. Paramedical students represent an important group in healthcare education, and their awareness about common dermatological infections is essential for early identification, prevention, and patient education. The study used a structured questionnaire to collect information regarding demographic details, personal hygiene practices, history of skin infections, knowledge about causes, symptoms, transmission, risk factors, and treatment options related to Tinea Versicolor.

The findings of the survey indicated that a noticeable proportion of students had experienced symptoms suggestive of Tinea Versicolor at some point. While many students were aware that the condition is a fungal infection, gaps in knowledge were observed regarding its risk factors, recurrence, and preventive measures. Factors such as excessive sweating, humid climate, poor personal hygiene, and sharing personal items were identified as potential contributors to the occurrence of the infection.

Overall, the study highlights the need for improved dermatological awareness and health education among paramedical students. Educational programs, awareness campaigns, and

preventive strategies can help reduce the prevalence and recurrence of Tinea Versicolor and promote better skin health among students.

### Conclusion overview

Most of the persons are using a turmeric paste compared to allopathic treatment of ketoconazole. The students are mostly believing a turmeric is cure to tinea versicolor. But I considered a lack of knowledge from students. The turmeric is best for skin treatment, also we know the alarming of tinea versicolor is more dangerous.

The turmeric using students have a month to cure, but the ketoconazole cures a week. And also, its cant repeat to them. Others are chances to affecting again to the white patches.

So, I thought to ketoconazole is best and safe treatment for tinea versicolor. I refer an allopathic treatment to tinea versicolor (whit pitches).

### FUTURE IMPLICATIONS

Future research should focus on assessing the long-term impact of Tinea versicolor education programs in medical curricula, and their effect on patient outcomes. Additionally, larger-scale studies across multiple healthcare institutions can provide more robust data to validate the results of this research. This would further help in refining educational strategies and developing comprehensive headache management protocols tailored for the healthcare sector.

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