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Tinea Versicolor - An Epidemiology

Mahendra Kumar Rai[1], Sonali Wankhade[1]*

Department of Biotechnology, SGB Amravati University, Amravati 444 602, Maharashtra, India

Abstract

Dermatophytic infections have been one of the major crises prevalent all over the world. Dermatophytes feed on skin, hair and nail thus causes infection, popularly known as 'Tinea infections'. Due to yeast *Malassezia furfur* multihued patches occurs on skin and causes infection known as Tinea versicolor (T.versicolor), which worsens if neglected. It has global occurrence and is prominent in hot and humid region. It predominantly affects late teens and young adults of both sexes. Customarily Tinea versicolor, is treated by systemic drugs in oral as well as topical mode. Despite adequate remedy, recurrence is common with major side effects. For overcoming adverse consequences, need arises to go naturewide and seek the solution through herbs. With the help of essential oils, this stubborn infection can be eradicated effectively, averting the side effects.

Keywords: Tinea versicolor; Dermatophytes; *Malassezia furfur*; Essential oils

Introduction

Tinea versicolor (pityriasis versicolor or PV) is a superficial fungal infection, characterized by changes in skin pigment due to colonization of the stratum corneum by a dimorphic lipophilic fungus of the normal flora of the skin, known as *Malassezia furfur* (Adamski, 1995; Sunenshine et al., 1998b; Zaitz, 2000; Moniri et al., 2009;). The organism's yeast phase shows two morphologically distinct forms, one ovoid, the other spherical, in which the fungus is named *Pityrosporum ovale* and *Pityrosporum orbiculare* respectively. PV is also known as tinea versicolor, dermatomycosis furfuracea and tinea flava. Although it may be distributed globally, it is more commonly found in the tropics. Often considered a post-pubescent disease, evidence shows that PV is common in children (Sunenshine et al., 1998b).

Historical considerations

T. versicolor was first recognised as a fungal disease by Eichsedt in 1846 (Ashbee and Evans, 2002). In 1853, Robin described the fungus in scales, naming it *Microsporum furfur* (Gordon, 1951a). In 1853, Malassez observed "spores" (Gordon, 1951b). Baillon, (1889) used the name *Malassezia furfur* in his text to commemorate Malassez (Ashbee et al., 2002). The genus name *Pityrosporum* was proposed by Sabouraud in 1904 (Inamadar and Palit, 2003) that were then named *Pityrosporum ovale* by Castellani and Chalmers in 1913 (Gupta et al., 2002). In 1951, Gordon isolated other yeast, micromorphologically distinct from *P. ovale*, and named it *Pityrosporum orbiculare* (Gordon, 1951a; Adamski, 1995; Sunenshine et al., 1998b; Zaitz, 2000; Ashbee et al., 2002). Clinico-epidermiological studies on T. versicolor were done by Rao et al., (2002).

Background

The lipophilic yeasts are associated with various human diseases, especially pityriasis versicolor, a chronic superficial scaling dermatomycosis (Gupta et al., 2002). High temperatures and humidity favour the occurrence of pityriasis versicolor (Muhammad et al., 2009). Accordingly, tropical areas can have prevalence as high as 40% and the frequency is higher during summer months in temperate climates (Sunenshine et al., 1998a).

Multiple macules and/or patches of variable appearance (hypopigmented, hyperpigmented, dark brown or erythematous) surrounded by normal skin are the typical lesions of pityriasis versicolor. Affected areas include the back, chest, abdomen, neck, and upper limbs. However, classically the back carries more lesions. The face is an area commonly affected in children and it is the forehead showing mostly hypopigmented macules (Terragni et al., 1991). Uncommon but possible locations include axilla, popliteal fossa, fore arms, lower limbs and penis/genitalia (Terragni et al., 1991; Sunenshine et al., 1998a; Sunenshine et al., 1998b; Moniri et al., 2009). Although PV had been described at the beginning of nineteenth century (Ashbee et al., 2002), until recently classification of its etiologic agent was a matter of doubt. This controversy may be caused by various morphological features and fastidious growth requirements of *Malassezia* yeasts *in vivo*.

Modes of infection

Tinea versicolor occur worldwide more frequently in areas with higher temperatures and higher relative humidities (Maheswari, 1978; Mellen et al., 2004).

Although pityriasis versicolor has worldwide occurrence, its frequency is variable and depends on different climatic, occupational and socio-economic conditions (Borelli et al., 1991; Sunenshine et al., 1998a). This disease is prevalent in Iran, in which almost 6% of all dermatosis and approximately 30% of dermatomycoses are due to these lipophilic yeasts (Borelli et al., 1991). Hereditary factor play the role in transmission of the disease (Maheswari, 1978; Sunenshine et al., 1998b).

Causal agent

- *M. furfur* is now the most commonly accepted name for the organism causing tinea versicolor. Thus, *P. orbiculare, P. ovale* and *M. ovalis* are synonyms for *M. furfur.*

***Corresponding author:** Sonali Wankhade, Department of Biotechnology, SGB Amravati University, Amravati 444 602, Maharashtra, India, E-mail: sonaliwankhade@rediffmail.com

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- Despite disagreement about the names, tinea versicolor results from a shift in the relationship between a human and a resident yeast flora.

Yeasts of the genus *Malassezia* are known to be members of the skin microflora of human and other warm-blooded vertebrates (Leeming et al., 1989; Moniri et al., 2009). These lipophilic yeasts are associated with various human diseases, especially pityriasis versicolor, a chronic superficial scaling dermatomycosis (Gupta et al., 2002). The genus of *Malassezia* has undergone several taxonomic revisions (Ingham and Cunningham, 1993). Later, Gueho et al., (1996) discovered that there were indeed multiple species which they reclassified and named the genus as *Malassezia* with several distinct species. Currently there are 11 recognised species viz, (1) *M. furfur,* (Crespo-Erchiga and Florencio, 2006; Krisanty et al., 2009), (2) *M. pachydermatis,* (3) *M. sympodialis* (Makimura et al., 2000; Arzumanian, 2001; Crespo et al., 2006), (4) *M. globosa* (Nakabayashi et al., 2000; Aspiroz et al., 2002; Dutta et al., 2002; Crespo et al., 2000; Crespo et al., 2006; Moniri et al., 2009), (5) *M. obtusa*, (6) *M. restricta,* (7) *M. slooffiae* (Gueho et al., 1996), (8) *M. dermatis*, (9) *M. equi* (10) *M. nana* (Sugita et al., 2002; Hirai et al., 2004) and (11) *M. japonica* (Sugita et al., 2005).

Mortality, race, sex and age

Morbidity results primarily from the discolouration. The adverse cosmetic effect of lesions may lead to significant emotional distress, particularly in adolescents. Tinea versicolor frequently recurs despite adequate initial therapy. Even with adequate therapy, residual pigmentary changes may take several weeks to resolve. Although tinea versicolor usually is more apparent in darker-skinned individuals, the incidence of tinea versicolor appears to be the same in all races.

The role of sex in propensity to development of T.versicolor is still unclear. Some studies found that PV is more common in men than women (Belec et al., 1991; Nakabayashi et al., 2000; Muhammad et al., 2009), while others indicated that the incidence of this infection is higher in women (Nikpoor and Leppard, 1978). No differences in development of PV among both sexes are also reported (Belec et al., 1991; Nakabayashi et al., 2000; Gupta et al., 2002).

T. versicolor becomes more noticeable with a suntan and is more common in teenagers and young adults than in older people (Lesher, 1994). However, children are not excluded from suffering this fungal infection (Terragni et al., 1991; Elewski, 1996; Gupta et al., 2002; Jena et al., 2005). Similar to other investigations the highest prevalence of PV was observed in 20-30 year-old group, suggesting that the peak of the infection is coincided with ages when the sebum production is in the highest level (Crespo et al., 2000; Gupta et al., 2002; Moniri et al., 2009). Very few cases of PV in a child with the age less than 10 years are found. Moreover, it is rarely seen in older adults (Bhargava et al., 1997; Rajashekhar, 1997).

Clinical symptoms

The main symptom is persistent patches of discolored skin with sharp borders (edges) and fine scales. The patches are often dark reddish-tan in color. Affected areas do not darken in the sun (skin may appear lighter than surrounding healthy skin):

- Increased sweating
- Itching

Physical symptoms

Lesion characteristics

- Lesions occur in a variety of colors and shapes, as the name implies (*versi* means several).
- Lesions are either macules or very superficial papules with fine scale that may not be evident except on close examina tion.
- Even when scale is not apparent, when the skin is wiped with a wet cloth and scraped for examination, it will yield a surprising amount of dirty brown keratin. If not, the areas of dyschromia may represent residual effects of previously treated T. versicolor.
- Occasionally, it is difficult to determine whether the lighter or darker skin is affected.
- Lesions have relatively sharp margins and may be lighter or darker than the normal skin color. The lesions are frequently a light orange or tan color in light-skinned individuals.
- Small lesions are usually circular or oval.
- Lesions are usually asymptomatic but may be mildly pruritic. The pruritus is more intense when the patient is excessively warm.
- Residual hypopigmentation, without overlying scale, may remain for many months following effective treatment. These areas may become more apparent following sun exposure, causing the patient to suspect incorrectly that the infection has recurred.

Lesion distribution

- The upper trunk is affected most commonly, but spread to the upper arms, antecubital fossae, neck, abdomen, and popliteal fossae often occur.
- Lesions in the axillae, groin, thighs, and genitalia may occur but are less common.
- Facial, scalp, and palmar lesions occur in the tropics but rarely in temperate zones.
- In some patients, T. versicolor primarily affects the flexural regions, the face, or isolated areas of the extremities. This unusual pattern of T. versicolor is seen more often in immunocompromised hosts and can be confused with candidiasis, seborrheic dermatitis, psoriasis, erythema or dermatophyte infections.
- Lesions that are imperceptible or doubtful are more visible using a wood lamp in a darkened room.

Treatment

Questioning the patient about skin or systemic diseases, current therapy and drug allergies provides guidance in selecting an appropriate therapy (Okuda et al., 1998; Crowson and Magro, 2003). Topical therapy alone is indicated for most patients (Gupta et al., 1998; Gupta et al., 2004b; Gupta and Kohli, 2003b). Systemic treatment is indicated with extensive involvement, recurrent infections or when topical therapy has failed (Gupta et al., 2003a). Because treatment is relatively easy and recurrence is common, it is imperative that therapy be as safe, inexpensive and convenient as possible. A plan for prophylactic therapy should be discussed with all patients to reduce the high rate of recurrence (Drake et al., 1996; Gupta et al., 2004a).

Topical medication

- Effective topical agents include selenium sulfide (eg, Selsun shampoo), azole antimycotics, ciclopirox olamine, piroctone-olamine, zinc pyrithione, propylene glycol lotions, lamisil derm gel (Faergemann et al., 1997), benzoyl peroxide, sodium sulfacetamide and allylamine antifungals (Vermeer and Staats, 1997). Treatment with selenium sulfide may result in irritant dermatitis. Patients may require emollient or mild topical steroid application for a few days following therapy.
- The topical azole antifungals work well, but no significant difference in results is achieved by different compounds. Topical azole and allylamine antifungals are applied every other night for 2 weeks. The weekly applications of any of the topical agents for the following few months may help prevent recurrence. The main problem with the use of azole antifungals in T. versicolor is the inconvenience of applying creams to a wide body surface area. The shampoo form of the antifungal can be used for extensive disease.

Drug category

Topical selenium sulfide products - Selenium sulfide inhibits *M. furfur*, the primary cause of T. versicolor. Selenium sulfide has cytostatic effect on epidermis and follicular epithelium, which reduces corneocyte production.

Selenium sulfide (Selsun Blue, Exsel, Head and Shoulders) - Available as shampoo or lotion in 1% or 2.5% concentrations. It is a safe and effective therapy that has been used for years (Albright and Hitch, 1966; Bamford, 1983; Katsambas et al., 1996; Hull and Johnson, 2004). However, it is an irritant, and some patients complain of itching or eczema after overnight applications. It also may stain clothes and bedding. Lotion is not preferred in children and patients with sensitive skin.

Over the conter and prescription creams

Products include clotrimazole (Lotrimin-AF) and ketoconazole (Nizoral) creams. Prescription alternatives for T. versicolor include ketoconazole (Nizoral shampoo), ciclopirox (Loprox), butenafine (Mentax), naftifine (Naftin) (Meinicke et al., 1984), econazole (Spectazole), oxiconazole (Oxistat) and sulconazole (Exelderm).

Oral medication

Some patients prefer oral therapy. It is recommended to take the oral drug with an acidic drink (e.g. orange juice, Coke) to improve absorption may enhance this therapy. Next, the patient should wait an hour and then exercise to the point of sweating. The patient then cools off, allowing the perspiration to dry on the skin, and showers after a few hours.

Oral therapy does not prevent the high rate of recurrence, and treatment with oral ketoconazole may need to be repeated on an intermittent basis throughout the year (Gan et al., 1987; Hickman, 1996; Fernandez-Torres et al., 2000; Gupta et al., 2003a; Gupta et al., 2003b; Rincon et al., 2006). Oral itraconazole and fluconazole also have been proven effective (Faergemann, 1992; Gupta et al., 1994; Kose, 1995; Leyden, 1998; Balachandran et al., 1999; Fernandez-Torres et al., 2000; Matar et al., 2003; Partap et al., 2004; Karakas et al., 2005) but rarely are required. Some sub-groups of *M. furfur* apparently are not clinically responsive to oral terbinafine (Tosti et al., 1996; Leeming, 1997; Fernandez-Torres et al., 2000). Griseofulvin is not an effective therapy for T. versicolor.

Ketoconazole (Nizoral)

A single dose of oral ketoconazole (400 mg) is very effective (Fernandez-Nava et al., 1997). Imidazole broad-spectrum antifungal agent; inhibits synthesis of ergosterol, causing cellular components to leak, resulting in fungal cell death. This drug achieves excellent skin levels with minimal dosing. *M furfur* is eradicated by the presence of ketoconazole in the outer skin layers (Rausch et al., 1984; Gan et al., 1987; Hickman, 1996). Children less than 10 year are not being treated with oral ketoconazole.

Combination

Various regimens use both topical and oral therapies. The most common is varying regimens of selenium sulfide shampoo or lotion and oral therapy with ketoconazole (Rausch, 1984).

Disadvantages

Disadvantages of topical treatment

Although topical drugs can provide immediate reductions in infectivity, are free of systemic adverse effects. These drugs have some disadvantages e.g. the time needed and difficult application of the drug over large affected areas, especially on the trunk, can not use in broken/open skin as well as the unpleasant odour of certain agents. For these reasons, patient adhesion is inadequate, which increases the rate of recurrence. Effectiveness of topical agents is lower, and rate of recurrence varies form 60 to 80% (Savin, 1996). It is found difficult to continue treatment or to know where to apply the cream, once the inflammatory signs have settled. Topical drugs may be difficult to use in certain areas e.g. on the hair, nails, nipples and in some more sensitive areas. Along with this some adverse reactions are most common such as increase in hypersensitivity and irritation occurs, mild dryness of the skin and itching etc. (Gupta and Summerbell, 2000).

Disadvantages of oral drugs

Drugs taken orally affect both diseased and normal tissues, thus increasing the chance of side effects. Inspite of short term treatment they bring lot of side effects. Shows hypersensitivity, not recommended for children, nausea, headache, vomiting. Hepatotoxicity may be associated with some oral antifugal medications (Sunenshine, 1998b). Conventional skin disease treatments such as the drugs ketoconazole, ciclopirox, naftifine and tolnaftate can irritate the skin, causing stinging, itching, redness, drying or allergic reactions (Gupta et al., 1998; Gupta and Summerbell, 2000).

Prevention

- T. versicolor has a high rate of recurrence and may require frequent prophylactic treatment with topical or oral therapy on an intermittent basis.
- Good personal hygiene may be helpful in limiting recurrences. Specifically, patients should shower as soon as possible after participating in activities or exercise that produce significant perspiration.

Medical/legal pitfalls

- Routine evaluation of hepatic function before therapy is seldom warranted for young healthy patients. However, patients at extra risk for preexisting hepatic dysfunction need assessment before treatment. Hepatotoxicity has been associated with the use of ketoconazole tablets, including rare fatalities. Several cases of hepatitis have been reported in children.
- In patients taking terbenafine concurrently with ketoconazole tablets and other serious ventricular dysrhythmias (in rare cases, leading to fatality) have been recorded.
- Pharmacokinetic data indicate that oral ketoconazole inhibits the metabolism of astemizole, resulting in elevated plasma levels of astemizole and its active metabolite desmethylastemizole, which may prolong QT intervals.
- Ketoconazole may enhance the anticoagulant effect of coumarin like drugs.

Future aspect

The existing treatments have lot of limitations and hence prove to be less effective. The factors contributing to its ineffectiveness are lengthy treatment, costly drugs and sometimes inability to cure the disease. This spawns the need of deriving an appropriate technology. The stepwise study is to be carried out in which foremost thing is the proper diagonosis. Effects of essential oils of various herbs are to be categorically studied on various factors such as sex, age, group, natural inhabitants, geographical conditions etc. Pathogenicity of dermatophytes is also to be studied. The above factors need a concurrent study and reasons for infections, remedies and effectiveness of the drugs are to be evaluated.

Now a day the importance of herbal drugs is reinstated and the world is turning towards safer drugs with no side effects. Thus the exploration of newer drugs from plants is most sought after, which will prove to be cheaper, safer and more effective. Historically, essential oils have been used for therapeutic purposes. In recent years, much research has been devoted to investigate such plant extracts, their active components, modes of action and synergistic effects with other antimicrobial compounds (Baris et al., 2006; Chuang et al., 2007; Zilda et al., 2008; Santos et al., 2008; Ademar et al., 2008; Barrera et al., 2009; Mahboubi and Kazempour, 2009; Mahboubia et al., 2009). These findings of researchers stimulate to explore other plant products, which could be exploited as effective antifungal, especially against T.Versicolor.

Conclusion

Tinea infection is an obstinate disease which bothered dermatologists a lot. The prime task of dermatologist is to precisely diagnose the underlying agent causing the disease. Once this is done, selection of a most favorable antifungal drug can be carried out effectively. Its spectrum of activity which covers the infecting microorganism can prove to be a potent treatment. Last decade showed some noteworthy progress in the evolution of effective and safe drugs for T. versicolor, but could not fulfill the expectations due to their negative aspects such as adverse reactions, expensiveness and lengthy treatment. Effective therapy demands oral suspension along with the topical drugs. But benefits of these drugs are outshined by the fact that they are having a lot of side effects, such as nausea, headache, vomiting, while less common adverse reactions are abdominal discomfort, transient rash, urticaria, diarrhea and photosensitivity etc.

Diagnostic methodology and fungal susceptibility testing lag behind therapeutic advances. We should turn our attention to these problems by seeking the solutions through the essential oils of medicinal plants. Essential oils are the rich resource of drugs for traditional, folk, synthetic and modern medicines; nutraceuticals and food supplements**.** Due to presence of numerous chemical compounds, plants of this family possess biological activity including antibacterial, antiviral, antifungal and anti-inflammatory.

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