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ABSTRACT

Objective: To determine the prevalence of superficial mycoses among psychiatric patients.

Design: Randomised Prospective study

Setting: Mathari Mental Hospital, and Jomo Kenyatta University of Agriculture and Technology, Nairobi Kenya.

Results: A study was conducted on prevalence of superficial fungal infections among psychiatric patients in Mathari Hospital, Nairobi, Kenya during the period of July to November 2009. 152 patients were assessed and samples collected from 25 patients with clinically suggestive symptoms of dermatomycosis revealed a 12.5% prevalence of superficial mycosis. There was no significant difference between males and females with superficial mycosis ($P>0.05$). Twenty percent of the patients who were on topical application had no viable organisms. *Microsporum* was the predominant species isolated while the skin was the site most commonly affected (64%). *Epidermophyton* was the least prevalent. Terbinafin was the most effective antifungal while *ketoconazole* was the least effective.

Conclusion: All patients admitted at Mathari hospital should be screened for fungal infection and treated. Terbinafin can be used as first line treatment of dermatomycosis after screening all psychiatric patients in Mathari Mental Hospital.

INTRODUCTION

Psychiatry encompasses virtually the entire spectrum of human mental and behavioural experience such as mood, eating, sexual and phobia disorders (1). Dermatophytes are parasitic fungi that infect the skin. They include the imperfect fungi of the genera *Epidermophyton*, *Microsporum* and *Trichophyton*. Each of the many species in these genera may produce clinical variations. At least 35 species have been identified in superficial skin infections (2).

Superficial fungal diseases affect all racial groups and tend to be resistant to routine therapy. *Tinea capitis* is prevalent in children than the adults while children from rural areas are more prone to the infection than their urban counterparts. The incidence of *Tinea capitis* is higher in children aged four to eleven years. The predisposing factors include; AIDS, age and chemotherapy (3).

Outbreaks of mycoses do occur but the incidence in the general population and restricted geographical sites suggests that these occurrences are case clusters

rather than epidemics. *Tinea pedis* is less frequent in India than United States, where it is the most common dermatophyte infection. *Epidermophyton* is a relatively rare cause of dermatophytosis in India but common in United States. *Tinea capitis* is caused by different organisms in different parts of the world. *T. tonsurans* is common in Mexico, *T. violaceum* in India while *T. vasicolor* is a common problem in tropical areas and relatively rare in cold and dry climates (4).

Data on mycoses in Kenya revealed a high prevalence rate (9-10%) in school children aged 3-17 years (5-7). Psychiatric patients are stigmatised and neglected population and hence prone to dermatophytosis. Most psychiatrists tend to concentrate on the mental condition than the health of the patient in totality. During infection with superficial mycoses, the host is sensitised to soluble fungal antigens (*Trichophyton*). Cell mediated immunity to dermatophytic infections occurs between the 10th and 35th days leading to pathogenesis, as a result of the host-parasite interaction (8).

Occasionally, the antifungals used for treatment of dermatophytes in the form of tablets, cream, solution gel, spray or powder are; Bifonazole, Clotrimazole, Nystatin, Isoconazol, Griseofulvin, Terbinafine and Amorofine (2, 9, 10).

MATERIALS AND METHODS

This prospective study was conducted at Mathari Mental Hospital, Nairobi, Kenya and Jomo Kenyatta University of Agriculture and Technology at the Medical Laboratory Science, Departmental Laboratory. The sample population consisted of patients admitted at the Mathari Mental Hospital. Patients who presented with superficial mycoses of hair, nail and skin and consented were included in the study. one hundred and fifty two patients were sampled, 25 patients fulfilled the criteria of fungal infection (A sample size of 25 subjects was randomly selected) (11). Simple random sampling was used to select the subjects.

Clinician examined the patients for dermatomycosis and also determined those with or without insights. The identified subjects with insight were issued with a consent form and those without insight, their next of kin consented for them. Questionnaires were pre-tested and administered. The affected area was thoroughly washed with either soaked gauze pad. The infected hair and nail of the selected subjects were cut from the tip attached to the cutaneous and the skin was scrapped using a scapel blade (3). The material was put in a sample envelope, sealed and transported to the laboratory for analysis.

Wet mount using 10% KOH was prepared for every sample by emulsifying some scrapings in a drop of 10% KOH on a glass slide and left for 30 minutes (skin scales) or two hours (nail).

After softening of material, the cover glass was gently pressed so to lie straight (4). This was examined microscopically at x40 objective for the spores.

The specimens were cultured on Sabouraud Dextrose Agar in sterile petri dishes and incubated at room temperature in a humid chamber. The cultures were examined daily for two to four weeks for morphological features. Identification of the mycoses was done by noting the colour of culture, appearance and mode of spread. Microscopy using lactophenol cotton blue was used to identify the type of conidia and hyphae. Disk diffusion technique was used to determine the most effective drugs for dermatophytosis (12). Chi-square and the P - value obtained from statistical table was compared with the calculated value to get the most effective drug ($P>0.05$).

Ethical considerations

Psychiatric patients with insight were required to consent while for those without insight, the next of kin who consented for their admission was also required to sign the consent form on their behalf.

A proval was given by Research and Ethical Review Committee and Mathari Hospital administration. The information given by the patients was treated with confidentiality.

RESULTS

Seventy two percent of the patients in this study had spent less than two months in the hospital. Patients aged 21-30 years had 63% infection (table 1) Skin was the most common site affected (64 %). Twenty eight percent of the patients were on topical application. *Microsporum* was the most predominant species. A total of 25 patients had symptoms of dermatophyte infection.

Table 1
Demographic characteristics of the respondents

Gender	Age bracket (years)	No. with symptoms	Period spent in hospital			Site infected		Type of Patients on mycoses			
			< a month	One month	Two months	Skin	hair	topical application	isolated	M T E	
Male	10-20	2	1	1	0	1	1	1	2	0	0
	21-30	9	2	4	3	8	1	4	5	0	0
	31-40	4	1	1	2	2	3	0	2	0	0
Female	10-20	1	1	0	0	1	1	0	0	1	0
	21-30	7	3	2	2	4	1	1	1	5	0
	31-40	2	1	1	0	1	1	1	0	2	0
Total		25	9	9	7	17	8	7	10	8	1

Key: M- Microsporum, T - Trichophyton, E- Epidermophyton

Ten patients had *Microsporum*, eight *Trichophyton* and One *Epidermophyton* Table 2.

Microsporum were seen as light and reddish brown in colour and appeared cottony and woolly with racquet hyphae containing macroconidia with five to eight septa Table 2. Others had pectinate and nodular hyphae with chlamydospores.

Trichophyton appeared as whitish cream to yellow with velvety and powdery texture and had macroconidia with three septa alternating on hyphae. *Epidermophyton* were greenish yellow, velvety and powdery with chlamydospore and thin walled macroconidia Table 2.

Table 2
Characteristics of the isolated dermatophytes

No. of cases	Cultural characteristics on SDA		Lacto phenol cotton blue preparation		Most probable type of fungi
	Color	Texture	Hyphae	Conidia	
6	TopView light brown Bottom view reddish brown	Cottony & woolly	Racquet with chlamydo spore	Macroconidia (5-8 septa)	<i>Microsporum</i>
4	Top view light brown Bottom view reddish brown	Powdery & buff	Pectinate and nodular with chlamydo spores	Macroconidia (4-6 septa) Rough walled	<i>Microsporum</i>
8	Whitish cream to yellow	Velvety & powdery	Septate hyphae	Macroconidia with 3 septa Microconidia alternating on hyphae	<i>Trichophyton</i>
1	Greenish yellow	Velvety & Thin walled	Chlamydo spore	Macroconidia powdery	<i>Epidermophyton</i>
6	-	-	-	-	No growth

Patients at age of 21-30 were more infected with superficial mycosis (63%) than 10-20 years (16%) and 31-40 years (21%) Table 3.

Table 3
Distribution of dermatophyte infection by age

Age (year)	No. infected	% Infected
≤20	3	16
21 – 30	12	63
> 31	4	21
Total	19	100

Sixty four percent of the admitted patients had stayed in the hospital for less than two months while 36% had stayed for months and beyond Table 4.

Table 4
Period spent in hospital

Period of admission	patient %
< 1 month	36
1 month	36
≥ 2 months	28

Table 5
Growth period for the dermatophytes

	0-6 Days	7-13days	14-21days
Microsporum	-	+	+++
Epidermophyton	-	++	+++
Trichophyton	-	+	+++

Key

- + - Color differentiation
- ++ -Hyphae differentiation
- +++ - Presence of Conidia

Microsporum were seen as light and reddish brown in colour and appeared Cottony and woolly (Fig. 1, plate 2). *Trichophyton* appeared as whitish cream to yellow with velvety and powdery texture

(Figure 1, Plate 1). Lacto phenol cotton blue microscopy of *Microsporum* had hyphae containing macroconidia five to eight septa while that of *Trichophyton* had macroconidia with three septa alternating on hyphae and microconidia (Fig. 1, Plate 3 and 4). *Nystatin* at 80µg/ml on *Trichophyton* had 14mm zone of inhibition while it was resistant to concentrations of 60µg/ml, 40µg/ml, and 10µg/ml. Miconazole at 100% concentration gave 25 mm on both *Trichophyton* and *Microsporum*.

Figure 1

Photo micrograph of dermatophytes

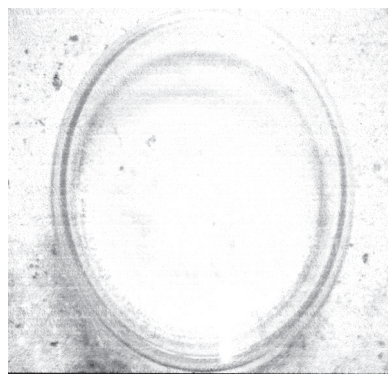


Plate 1: 21 days culture of *Trichophyton*

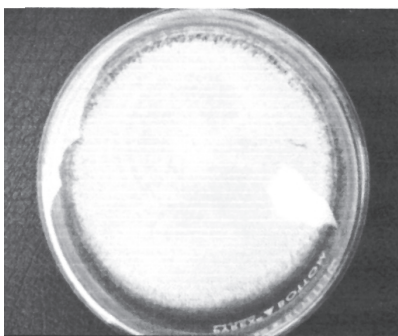


Plate 2: 21 days culture of *M. canis. spp*

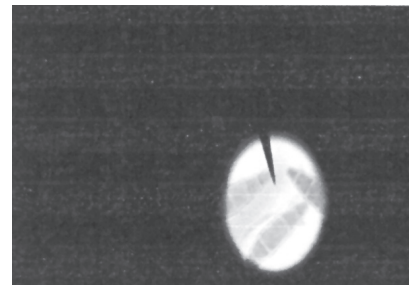


Plate 3: Microscopy of *Trichophyton spp*

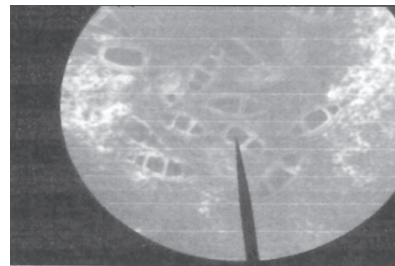


Plate 4: Microscopy of *Microspatum*

Performance Standards for Antimicrobial Disk Susceptibility Tests (NCCLS, 2000) Interpretive

Designation	Zone size (mm)
Susceptible	≥17
Intermediate	14-16
Resistant	≤13

Table 6

The observed and confirmed cases of dermatophytes

Patients	Infected	Total	
		Non infected	infected
Males	10	44	54
Females	9	89	98
Total	19	133	152

The prevalence of dermatomycosis among the patients was found to be 12.5% (fig. 1)

Figure 2

Prevalence of dermatomycosis

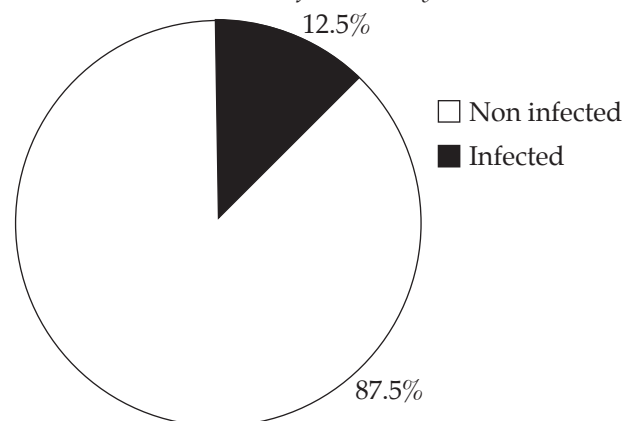


Table 7
The most common dermatophyte among the patients

Gender	Number of patients infected			Total
	Microsporum	Trichophyton	Epidermophyton	
Male	9	0	1	10
Female	1	8	0	9
Total	10 (53%)	8 (42%)	1 (5%)	19

There was no significant difference between psychiatric males and females infected with dermatophytes in Mathari hospital (P-value > 0.05). Microsporum was more common in males (47%) as

compared to females (5%) while Trichophyton was only seen in females (42%) and Epidermophyton only in males at 5%.

Figure 3
Proportion of dermatophytes in females and males (%)

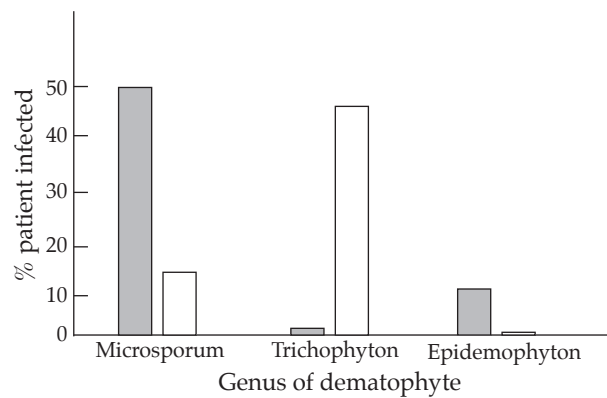
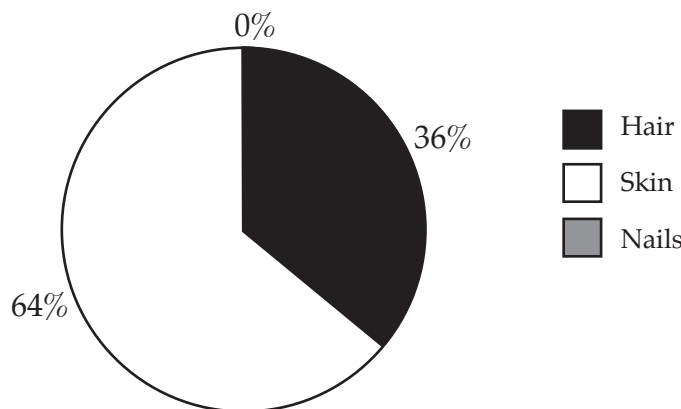


Figure 4
Proportion of infection by site among the patients



There was a significant difference (P > 0.05) in efficacy of antifungal drugs used in treatment of superficial mycoses. *Terbinafin* was found to be the most effective antifungal drug at all the concentrations used on both *Trichophyton* and *Microsporum* with complete inhibition of growth. Griseofulvin was more effective on *Microsporum* than *Trichophyton*. *Miconazole* had 25mm inhibition zone on both organisms. *Nystatin* and *ketoconazole* were the least effective antifungal drugs.

Performance Standards for Antimicrobial Disk Susceptibility Tests (NCCLS, 2000)

Interpretive Designation	Zone size (mm)
Susceptible	≥17
Intermediate	14-16
Resistant	≤13

Figure 5
Microsporium susceptibility to antifungal agents (11).

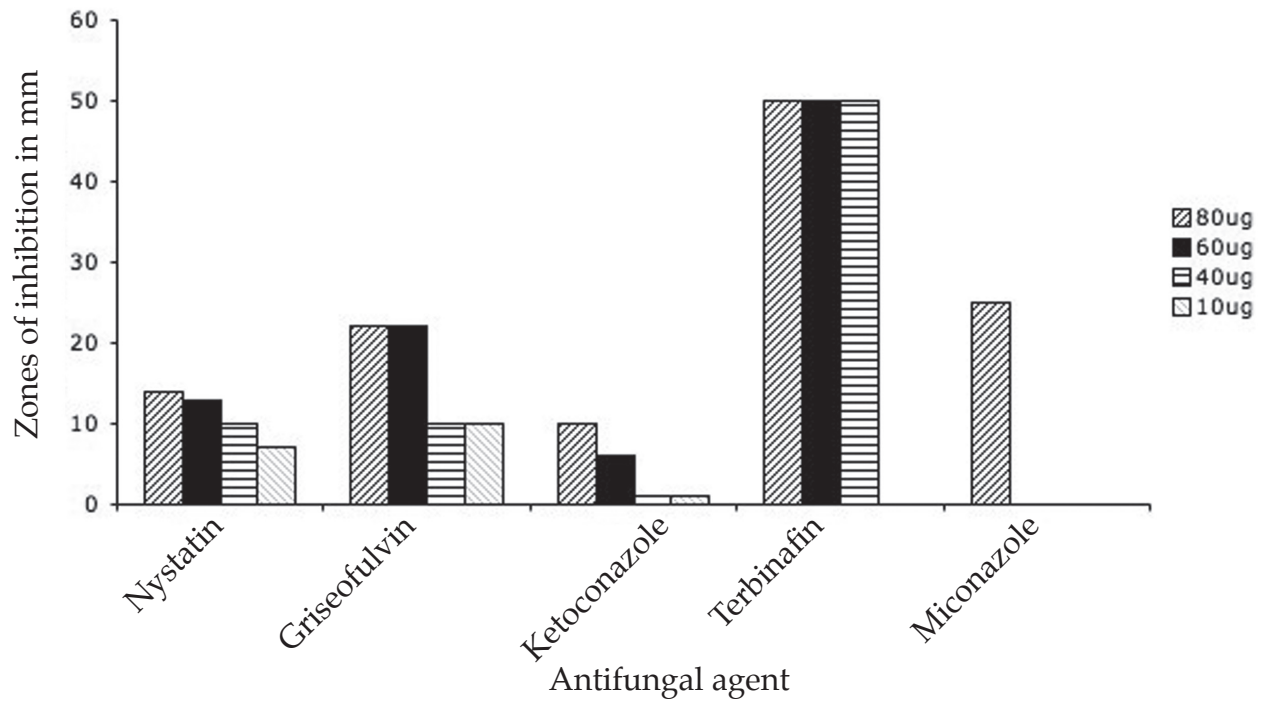
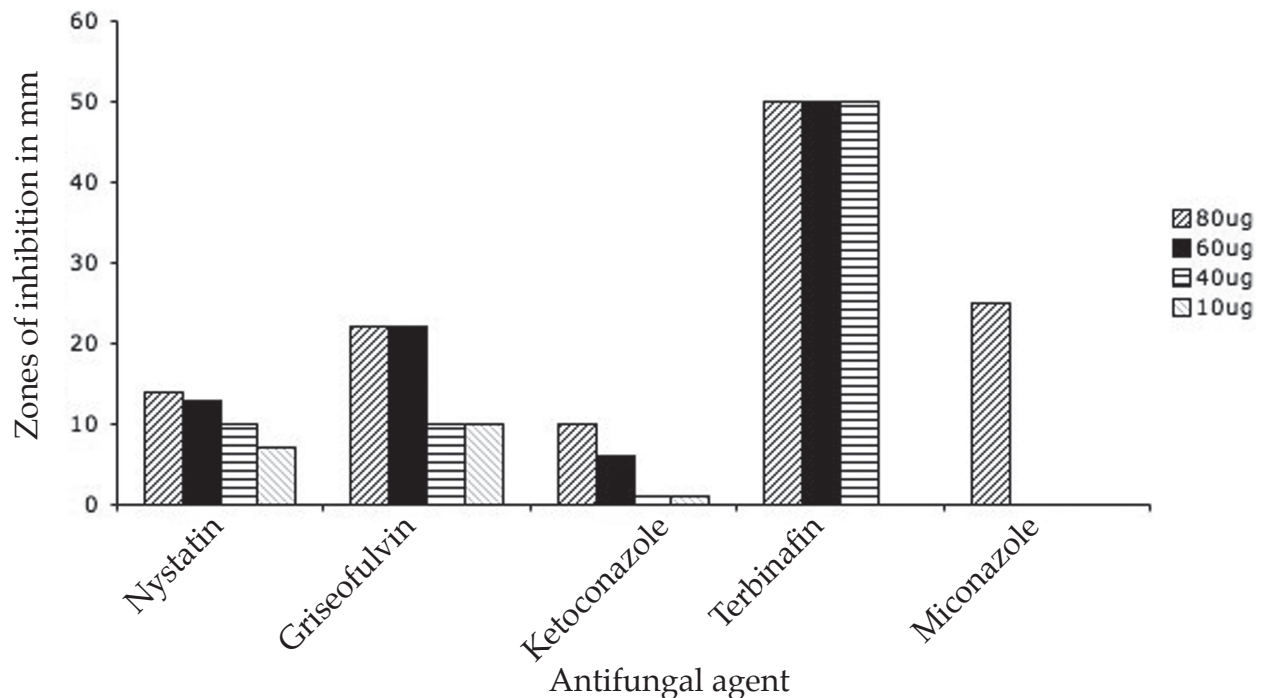


Figure 6
Trichophyton susceptibility to antifungal agent



DISCUSSION

Management of superficial mycosis is one of the health needs in psychiatric patients which do not receive adequate attention. The findings of this study show a prevalence rate of 12.5% in adult psychiatric patients.

This is in line with a study carried out in Kenya (7) which revealed a 9.5% prevalence of superficial mycosis in school children. It also concurs with another study which showed a prevalence of mycosis at 10.1% in school children aged 3-17 years with *Tinea Capitis* at a prevalence of 7.8% (6). The most common cause of *Tinea Capitis* in school going children in

Eldoret, Kenya was found to be *T. tonsurans* (5). The slight difference in prevalence rates could have been contributed to by the difference in age groups (children and adults) of the population in studies. According to Nweze (13), young children (aged 4-11) have significantly higher incidences than their older colleagues (aged 12-18). Another study carried out in Yaounde on prevalence of superficial mycoses in HIV positive subjects revealed a rate of 53% (14).

Dermatophyte infection was more common in psychiatric patients aged 21 -30 years. This concurs with an earlier study conducted (15) on cadets from the Italian Navy where males and females age 18-30 years had a prevalence rate of 3.2% compared to 3.9% in psychiatric patients aged 21-30 years.

The presence of live dermatophytes in most of the samples studied suggests the existence of superficial mycoses in the population. There were more than one type of dermatophyte isolated from the skin and hair. The study further indicates that *Microsporum* is the most common species of dermatophyte in psychiatric patients unlike a study conducted in Natal, Durban (8) and Taranto (13) on superficial mycoses which indicated that *Trichophyton rubrum* and *T. mentagrophytes* were the most predominant species. The most common site affected among the patients was the skin while there was no significant difference between psychiatric males and females infected with dermatophytes in Mathari Mental Hospital ($p > 0.05$). Twenty percent of the patients who were on antifungal drugs had no viable organisms (Table 1).

Susceptibility tests carried out on the isolates as per the National Committee for clinical Laboratory Standards, NCCLS (9) assays using five antifungal drugs indicated that terbinafin was the most efficacious, followed by miconazole, griseofulvin, nystatin and lastly ketoconazole. This result concurs with Hussein *et al.* (16) who studied the activities of four antifungal agents in dermatophyte nail infection and used *Trichophyton*, *Epidermophyton* and *Microsporum species*, and found that terbinafin inhibited the growth of dermatophytes more effectively.

In addition Santos *et al.* (17) studied susceptibility of 52 isolates of *T. rubrum* and 40 of *T. mentagrophytes* to terbinafin, Itraconazole, Ketoconazole, Fluconazole and Cyclopiroxolamine. They concluded that Terbinafin was the most effective followed by Itraconazole, Cyclopiroxolamine, Ketoconazole and Fluconazole. Terbinafin acts by inhibiting squalene epoxidase, an enzyme which converts squalene to squalene epoxide during biosynthesis hence inhibits cell membrane synthesis (18). The dermatophytes could not be able to survive without ergosterol and this led to their complete inhibition. Ketoconazole was the least effective with a very small zone of inhibition

relative to other antifungals used. Miconazole and Ketoconazole are imidazoles whose mode of action is based on the inhibition of ergosterol biosynthesis in fungi and change in composition of the lipid components in the fungal membrane resulting in fungal cell necrosis.

There is no significant difference between males and females with the infection. The most common site for the infection is the skin followed by hair. *Microsporum* is the most commonly isolated fungi while *Epidermophyton* is the least. Terbinafin is the most efficacious antifungal drug as compared to nystatin, griseofulvin, ketoconazole and miconazole.

It is recommended that there should be routine screening of superficial mycosis in psychiatric patients and treatment commenced in positive cases. The choice of drug used should be based on the susceptibility of the organism to the antifungal.

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