



## Prevalence, Pattern and Clinical Variations of Dermatophytosis in Patients with HIV Infection at the University of Port Harcourt Teaching Hospital, Port Harcourt

Dasetima D. Altraide<sup>1</sup>, Mary N. Amaewhule<sup>2</sup> and Bolaji Otiike-Odibi<sup>1\*</sup>

<sup>1</sup>Department of Medicine, UPTH, Port Harcourt, Nigeria.  
<sup>2</sup>Department of Medicine, RSUTH, Port Harcourt, Nigeria.

### Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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### ABSTRACT

**Background:** Immunosuppression due to various etiologies has been associated with the occurrence of dermatophytosis. Several studies in the past have demonstrated that Human Immunodeficiency Virus (HIV) infection is a risk factor for the acquisition and severity of dermatophytosis. This study examined the prevalence and clinical variations of dermatophytosis amongst HIV positive patients seen in Port-Harcourt, Southern Nigeria.

**Methods:** Between July 2019 and 2020 173 seropositive cases and 173 seronegative controls were recruited for this study. They were interviewed with a structured questionnaire and thereafter screened for the presence of dermatophytosis and sent for mycology studies.

**Results:** There was a higher prevalence of dermatophytosis in the HIV seropositive group when compared to the control group. Most of the lesions seen were not markedly different from that seen in immunocompetent persons. 41.65% of the cases were found among those with CD4 cell counts below 200. Tinea corporis was the commonest lesion seen (50%). *Trichophyton* species was the commonest dermatophyte isolated, followed by *Microsporum spp.*

\*Corresponding author: E-mail: Bolajio\_o@yahoo.com;

**Conclusion:** Prevalence of dermatophytosis is significantly higher in HIV infected patients and commonly occurs in advanced stages of the disease. Tinea corporis is the most common lesion in this group of patients and *Trichophyton spp.* a common causative agent.

*Keywords:* Dermatophytosis; HIV; immunosuppression.

## 1. INTRODUCTION

Dermatophytosis is a superficial fungal infection of the skin, hair, or nails. They are characterized by their ability to exist and grow in keratin, enabling them to invade the stratum corneum of the skin and keratinized structures such as hair and nails with minimal stimulation of the host's immune response.

Dermatophytes belong to 3 genera

- Trichophyton
- Microsporum
- Epidermophyton

Dermatophytes grow best in a warm, humid environments and are therefore more common in the tropics and subtropics. There are about 40 recognized species of dermatophytes. Some are only able to infect man (antropophilic), others are primarily animal pathogens (zoophilic) but can also infect man. Other species are found as saprophytes in the soil (geophilic), and cause sporadic infection in man and animals.

Dermatophytosis are mild communicable diseases with high morbidity and contributes to major health problems in the tropics and subtropics especially in Nigeria. Most surveys on dermatophytosis done in the past have been carried out on school children and have concentrated mainly on Tinea capitis. This maybe because of the social stigma attached to it, possibility of alopecia and other associated secondary diseases such as bacterial infection of the lesions.

The prevalence rate of dermatophytosis in the general population in a study done in Lagos was 6.1% [1] and in children in a hospital based study in port Harcourt 15.5% [2].

Dermatophytes produce a variety of proteolytic enzymes which play a role in the invasion of the stratum corneum, hair and nails. There is some heterogeneity in substrate preference of dermatophytes.

While all dermatophytes invade stratum corneum, different species vary widely in their ability to invade nail and hair.

Other host factors affecting dermatophyte infections are as follows genetic susceptibility, reduced immunity in old age, diabetes mellitus, Cushing's syndrome, steroid treatment and HIV infection.

Environmental factors like humidity and raised CO<sub>2</sub> tension favour dermatophyte invasion. Raised temperature of more than 37°C inhibits dermatophyte growth. This is responsible for the lack of deeper penetration of the skin in dermatophytosis

### 1.1 Clinical Features

The disease produced by dermatophytes are described according to anatomic site involved viz-tinea capitis (scalp) tinea barbae (bearded skin of the face) tinea corporis (the body), tinea cruris (groin) tinea unguium (the nails) tinea manuum (hand) and tinea pedis (the feet).

These infections may vary from mild inflammations to acute vesicular reactions.

The incubation period in human is 1 to 2 weeks.

Chronic dermatophyte infections may be the first manifestation of HIV and may suggest HIV infection because of increased severity of presentation, atypical clinical appearance or increased resistance to treatment.

### 1.2 The Burden of HIV

HIV infection is a major challenge and health problem worldwide. It was first discovered in Los Angeles, California in young homosexual men who presented with disseminated Kaposi sarcoma and pneumocystic carinii infection in 1981 [3,4,5].

Worldwide more than 33 million people are infected with over 60% in sub Saharan Africa, and more than 8,000 deaths per day [6].

The prevalence rate for HIV in Nigeria is 1.4% according to a recent sentinel survey carried out in various centers in the country [7].

Human Immunodeficiency Viral infections are commonly associated with a myriad of various

skin conditions including dermatophytosis and this may be the first manifestation of the disease.

HIV infection produces a panorama of mucocutaneous manifestations, from the macular roseola-like rash seen with the acute sero-conversion syndrome to an array of severe and extensive skin lesions seen as the disease progresses [8].

Fungal infections are a common complication in HIV infection and include dermatophytosis, deep mycosis and yeast infections [9].

Nnoruka et al (2007) in a study to access the pattern of skin disease in HIV positive patients and their correlation with CD4 cell counts found out that dermatophytosis constituted 24.3% of all cases of skin diseases seen in this group of patients. Four hundred and seventy-seven HIV sero-positive patients were used in the study. The mean CD4 cell count of patients with dermatophytosis was  $437.3 \pm 177$  cells/ $\mu$ L [10].

In a study in India by Shobhana et al (2004), 410, HIV seropositive patients were screened for skin disease. It was found that 40% had mucocutaneous involvement at presentation. Mean age of the study population was 29 years and male to female ratio was 2.5:1. The common mucocutaneous morbidities detected include oral candidiasis (36%), dermatophytosis and gingivitis (13% each), herpes zoster (6%), herpes simplex and scabies (5% each). A striking feature noted in 36% of the males was straightening of the hairs. Genital herpes was the commonest genital ulcer disease. Lesions associated with a declining immunity include oral candidiasis, oral hairy leukoplakia and herpes zoster with median CD4 cell counts of 94, 62 and 192 cells/ $\mu$ L respectively. It was concluded from this study that a recognition of the protean mucocutaneous diseases in HIV/AIDS helps in earlier diagnosis of HIV as well as a measure of the immune status of the individual [11].

Dermatophytoses are common cutaneous fungal infections in HIV infected patients and can occur at any stage of the illness, and show clinical variations [12,13]. In the immunocompetent host, various risk factors have been identified for the acquisition of dermatophytosis. These include poverty [14,15] close contact with animals and soil [16,17,18] (especially for geophilic and zoophilic dermatophytes). Use of poorly sterilized barbing equipment have also been identified as an important risk factor for transmission of tinea capitis in this environment

and in one study was responsible for the high prevalence of tinea capitis in the community [19]. An important risk factor for tinea pedis infection is the frequent wearing of cover shoes. The warm humid environment surrounding the feet provides a conducive environment for the growth of dermatophytes for this group of persons [20].

The commonest clinical presentations of dermatophytosis in immunocompetent persons are tinea corporis and tinea capitis [20]. Various studies have demonstrated unusual clinical presentations and higher prevalence rates of dermatophytosis among HIV seropositive patients. In one study by Goodman et al (1987), it was 4 times higher in HIV positive patients [21]. In that study 117 HIV seropositive patients were recruited. Dermatophytosis was seen in 30% of the patient. Other common skin diseases seen were: candidiasis (47%), seborrheic dermatitis (32%), acquired ichthyosis or xerosis (30%) and herpes simplex infection (22%).

## 2. METHODOLOGY

This is a cross section sectional study assessing the prevalence and pattern of dermatophytosis among patients with HIV infections in the University of Port Harcourt.

One hundred and seventy-three patients who presented with newly diagnosed HIV infection at the Anti-retroviral clinics and wards of the University of Port Harcourt Teaching Hospital, Port Harcourt were recruited into the study over a period of ten months and their consent obtained to participate in the study.

Control population: One hundred and Seventy-three patients that were screened for HIV infection and found to be seronegative.

The subjects also had their CD4 cell counts assayed and documented.

### 2.1 Statistic Analysis

The statistical software (Epi info 2002) was used for data entry and analysis. Frequency was determined by percentages of patients with dermatophyte infection among the total HIV patients studied. Data was expressed as means for numerical variables and the student T test was used to compare them. Categorical variables was compared using Chi square.

### 3. RESULTS

#### 3.1 Study Population

A total of one hundred and seventy-three HIV seropositive patients and one hundred and seventy-three seronegative controls were recruited for this study.

#### 3.2 Demographic Data

All of the subjects are Nigerians and resident in Rivers state. The case and controls were matched for age and sex.

One hundred and five of the cases were females while sixty-eight were males. Male to female ratio = 1:1.54. for the subjects, and 1:1.74 for the

control. The difference is not statistically significant.

The ages of the cases ranged from 2-75 years with a mean age of  $33.3036 \pm 12.61914$ . For the control, the age range is from 2-77 years with a mean age of  $35.4404 \pm 14.02180$ . This difference is not statistically significant. Other details are as shown in the table.

#### 3.3 CD4 Cell Count of the Subject

The mean CD4 cell count of the cases is 355.3. The range is between 21 and 1,260. The mean CD4 Cell count for the control is 865.3 with a range of 778-1000. Forty-one percent of the cases have a CD4 cell count between 200-500 cell/ $\mu$ l.

**Table 1. Age stratification of cases and controls**

Age group (years)	Cases (%)	Controls (%)	Total population
2-10	10 (5.78)	9 (5.2)	19 (5.4)
11-20	4 (2.3)	6 (3.4)	10 (2.8)
21-30	63 (36.4)	61 (35.2)	124 (35.8)
31-40	54 (31.2)	52 (30.0)	106 (30.6)
41-50	31 (17.9)	34 (19.6)	65 (18)
51-60	6 (4.0)	7(4.0)	13 (3.7)
61-70	2 (1.1)	2 (1.1)	4 (1.1)
>71	3 (1.7)	2 (1.1)	5 (1.4)
TOTAL	173 (100)	173 (100)	346 (100)

**Table 2. Demographic data of HIV sero-positive cases and the HIV sero-negative controls**

Variable	HIV sero-positive cases (%)	HIV sero-negative controls (%)
<b>Gender</b>		
Male	68 (39.3)	63 (36.4)
Female	105 (60.6)	110 (61.8)
Total	173 (100)	173 (100)
<b>Marital status</b>		
Ever Married	104 (60.1)	87 (50.2)
Never Married	69 (39.8)	86 (49.7)
Total	173 (100)	173 (100)
<b>Occupation</b>		
Civil Servant	20 (11.3)	20 (11.5)
Student	12 (7.1)	18 (10.4)
Self-employment	16 (9.5)	24 (13.8)
Trader	26 (14.88)	16 (9.2)
Armed forces	6 (3.57)	2 (1.1)
Unemployed	19 (10.7)	22 (12.7)
Others	74 (42.7)	71 (41)
Total	173 (100)	173 (100)
<b>Educational status</b>		
None	13 (7.5)	12 (6.9)
Primary	29 (16.6)	18 (10.4)
Secondary	72 (41.0)	50 (28.9)
Tertiary	59 (33.9)	93 (53.7)
Total	173 (100)	173 (100)

**Table 3. CD4 cells count grouping according to sero-status**

CD4 Cell	Count (cells/ $\mu$ l	Cases (%)	Controls (%)	Total (%)
<50		8(4.6%)	0	8(4.6%)
50-200		50(28.9%)	0	50(28.9%)
200-500		72(42.6%)	0	72(41.6%)
<500		43(24.8%)	0	216(62.4%)
TOTAL		173(100%)	173(100%)	346(100%)

### 3.4 Medical History of Controls and Cases

Variables CASES (%)	Controls (%)	Total (%)
History of use of bleaching	63(36.3%)	41(23.8%) 104(30.0%)

### 3.5 Cosmetics

#### 3.5.1 Types of bleaching cosmetics

Steroids	11(6.5%)	12(7.1%)	23(5.2%)
Hydroquinone	53(30.3%)	37(21.4%)	90(26.0%)
History of contact with a person With skin disease	5(2.8%)	12(6.9%)	17(4.9%)

### 3.6 Medical History of the Cases and Controls

Sixty-three (36.9%) of the cases had prior history of use bleaching cosmetics compared to 541 (23.81%) of the control. Hydroquinone is the most common abused bleaching agent as shown in the table below.

Five (2.8%) of the cases had a history of close contact with somebody with a skin disease compared to 12 (6.9%) of the control

### 3.7 Clinical Findings in the Cases and Controls

**Chart 1. Variables**

Presence of skin lesion	60(34.6%)	12(6.9%)
Mean duration of symptoms (In weeks)	71.47 $\pm$ 17.69	8.22 $\pm$ 3.11
Previous treatment	28(16.01%)	5(5.9%)

## 4. DISCUSSION

This study was carried out to assess the prevalence and pattern of the various types of dermatophytosis among HIV infected patients as compared to apparently healthy seronegative controls.

Various skin conditions are associated with HIV infection.

Epidemiologic studies have shown that almost all persons with HIV infections will have skin disorders at some point during their disease [21]. Skin disorders commonly encountered in HIV-

infected patients may be the first manifestation of HIV disease. Up to 90% of HIV-infected persons suffer from skin disease during the course of their illness [22].

In a recent cross-sectional study of 186 HIV positive patients, 175 (94%) suffered from one or more cutaneous disorders [23]. The most common skin disorder identified was fungal infection, followed by eczema and seborrheic dermatitis. The spectrum of skin disorders depends on:(a) immunologic stage, as reflected by CD4 count (b) concurrent use of HAART (Highly Active Anti-Retroviral Therapy) (c) pattern of endemic infections.

In general, declining immunity is associated with increased number and severity of skin disorders [24]. Skin lesions are more likely to have unusual appearances in advanced HIV infection.

**Table 4. Prevalence of various skin lesions in the HIV positive cases and controls**

Types of skin lesion	Cases (%)	Controls (%)	Total population (%)
Pruritic popular eruption	24 (13.8)	-	24 (6.9)
Dermatophytosis	12 (6.9)	5 (2.8)	17 (4.9)
Acne vulgaris	4 (2.3)	4 (2.3)	8 (2.3)
Kaposi sarcoma	2 (1.15)	-	2 (0.5)
Herpes genitalis	3 (1.7)	-	3 (0.86)
Furunculosis	3 (1.7)	2 (1.15)	5 (1.4)
Herpes zoster	3 (1.7)	-	3 (0.86)
Warts	2 (1.15)	-	2 (0.5)
Molluscum contagiosum	2 (1.15)	-	2 (0.5)
Fixed drugs eruption	1 (0.5)	-	1 (0.25%)
Tinea versicolor	1 (0.5)	2(1.15%)	3 (0.86)
Keloids	1 (0.5)	-	1 (0.25%)
Urticaria	1 (0.5)	-	1 (0.25%)
Epidemodysplasia verruciformis	1 (0.5)	-	1 (0.25%)
Total	60 (34.6)	12 (6.9)	72 (20.8)

**Table 5. Mean CD4 cell counts of the HIV positive cases with various skin lesions**

Types of skin lesion	No. of cases (%)	Mean CD4 cell count
Pruritic popular eruption	24 (13.8)	199.54
Dermatophytosis	12 (6.9)	226.2
Acne vulgaris	4 (2.3)	370.75
Kaposi sarcoma	2 (1.15)	365.5
Furunculosis	3 (1.7)	317.67
Herpes zoster	3 (1.7)	203
Warts	2 (1.15)	272.5
Herpes genitalis	3 (1.7)	88
Urticaria	1 (0.5)	567
Keloids	1 (0.5)	400
Fixed Drugs eruptions	1 (0.5)	526
Tinea versicolor	1 (0.5)	611
Molluscum contagiosum	2 (1.15)	113
Epidermodysplasia verruciformis	1 (0.5)	51
Total	60(34.6%)	224.86

**Table 6. Demographic characteristics of cases with dermatophytosis**

Variables	Tinea corporis	Tinea unguium	Tinea manum	Tinea pedis	Total per age group
<b>Age</b>					
2-20	0	2	0	0	2
21-40	2	0	1	0	3
41-60	2	0	1	2	5
>61	2	0	0	0	2
Total	6 (50%)	2 (16.6%)	2 (16.6%)	2 (16.6%)	12 (100%)
<b>Gender</b>					
Male	4	0	2	2	8
Female	2	2	0	0	4
Total	6 (50%)	2 (16.6%)	2 (16.6%)	2 (16.6%)	12 (100%)

**Table 7. Demigraphic characteristics of the control with dermatophytosis**

Variables	Tinea coporis	Tinea unguium	Tinea manum	Tinea pedis	Total per age group
<b>Age</b>					
2-20	1	0	0	1	1
21-40	0	0	0	0	10
41-60	1	1	0	0	5
>61	0	0	1	0	0
Total	2 (40%)	1 (20%)	1 (20%)	1 (20%)	5 (100%)
<b>Gender</b>					
Female	2	1	0	0	4 (80)
Male	0	0	0	1	1 (20)
Total	2 (40%)	1 (20%)	1 (6.25%)	1 (20%)	5 (100%)

**Table 8. Dermatophytosis among the cases stratified by cd4 cell count**

CD4 count	Tinea corporis (%)	Tinea unguium (%)	Tinea manum (%)	Tinea pedis (%)	Total with dermatophytosis (%)
0-200	4 (33.3)	0	1 (8.3)	0	5 (41.6)
201-400	2 (16.6)	2 (16.6)	1 (8.3)	1 (8.3)	6 (50)
401-600	0	0	0	0	0
601-800	0	0	0	1 (8.3)	1 (8.3)
801-1000	0	0	0	0	0
1001-1200	0	0	0	0	0
Total	6 (50)	2 (16.6)	2 (16.6)	2 (16.6)	12 (100)

**Table 9. Mycology results of HIV positive cases with clinically diagnosed dermatophytosis**

Species	Frequency	Percentage
<i>Microsporum auodonii</i>	1	8.3
<i>Trichophyton soudanenses</i>	2	16.6
<i>Trichophyton mentagrophyte</i>	2	16.6
Other species ( <i>Aspegillus penicillium</i> )	5	41.6
No significant growth	2	16.6
Total	12	100

**Table 10. Mycology result of the controls with clinically diagnosed dermatophytosis**

Species	Frequency	Percentage
Non-dermatophytic fungi	3	60
No significant growth	2	40
Total	5	100

In this study the prevalence of several skin diseases was found to be significantly higher in the HIV seropositive group compared to the seronegative controls (34.6% vs. 6.9%). The mean duration of the lesions was also longer for the cases compared to the control group (71 weeks vs. 8 weeks). In addition, the mean CD4 cell count of the HIV seropositive cases with skin disease was significantly lower than those without any skin disease thus indicating the importance of immunosuppression in the development of skin disease in such patients.

Dermatophytosis is the second commonest skin lesion in the HIV seropositive group (next to pruritic papular eruption of HIV). It has a significantly higher prevalence among the cases when compared to the control group -6.9% vs. 2.8%, ( $p < 0.05$ ).

The prevalence of dermatophytosis in HIV positive cases used in this study is 6.9%. previous studies done in the past revealed prevalence rates between 6.06% and 30%. [12,25,26,27,28]. The relatively low prevalence

observed in this study may be attributable to the relatively fewer number of subjects studied and to the low frequency of contact with infected persons as observed in this (only 2.8% of cases admitted to having any history of contact with other persons with skin lesions).

Cases with dermatophytosis have a mean CD4 cell count of 226.2, this figure can be said to be much lower when compared to other studies where mean CD4 cell counts in HIV positive patients with dermatophytosis ranged from 267-450 [29,30] of the cases with clinical dermatophytosis, 41.6% have CD4 cell count between 0 and 200. From these findings it can be concluded that dermatophytosis is directly related to the degree of immunosuppression in HIV sero positive patients.

Tinea corporis is the commonest dermatophytic lesion seen among the cases. In previous studies sited earlier it was also found to be the commonest in the setting of HIV infection. This is in keeping with other studies where tinea corporis or capitis were found to be the commonest dermatophytosis affecting HIV patients [26,28,31,32] all of the cases seen in this study had CD4 cell count below 400 (two thirds below 200). Other studies done in the past revealed a similar high prevalence in patients with low CD4 cell count. Most of the lesions seen were of the classical annular types with active edges and healing centers or tinea incognito. Two of the cases with tinea corporis had extensive involvement of the trunk, limbs and flexures, with hyper pigmented, thick scaly plaques. This is in keeping with findings from previous studies that have demonstrated atypical presentations of tinea corporis in immunosuppressed persons with HIV infection. The paucity of such atypical lesions (in this study) may be due to the fact that the patients may have utilized one form of antifungal treatment or another prior to presentation.

Another common type of dermatophytosis seen among the cases was tinea unguis, the patients with these lesions had a CD4 count of 400 and below. Moreover, all of the cases with onychomycosis fall within the 20-40 years' age group who are more prone to trauma compared to other age groups (prior trauma is a risk factor for onychomycosis). It is rare in HIV positive children. In a recent study on prevalence of dermatophytosis in HIV positive children in Nigeria, tinea unguis constituted just 5% of the

total no of dermatophytosis seen in the entire population [32].

The typical lesions seen in HIV- proximal white subungual onychomycosis and superficial white onychomycosis were not seen in this study. However, the patients seen had nail dystrophy, discoloration, onycholysis and nail destruction. Onychomycosis in the setting of HIV infection usually involves the toe nails, however in this study, the cases seen were the finger nails. This may be attributed to the fact that most of the cases seen were women (61.2%) who are more exposed to moisture in the course of their household chores than their male counterparts.

Tinea capitis, a common dermatophyte infection in children was not seen in any HIV positive child. This may be attributed to the fact that only a small proportion of children were used in this study. A 13-year-old school boy in the control group had it. He presented with patchy alopecia.

Tinea manuum and tinea pedis were encountered less frequently in this study and the morphology of the lesions seen were not significantly different from those seen in immunocompetent HIV negative persons. No case of tinea cruris was seen in this study. This may be attributed to the fact that a relatively fewer number of males were used in this study since it occurs more frequently in the male sex.

There is a low mycology yield of specimens cultured in this study. This may be attributed to adulteration of the culture media or prior treatment of the skin lesions by the subjects.

The commonest dermatophyte isolated in this study was trichophyton spp. This is in keeping with findings in several other studies where it has been found to be the commonest aetiologic agent of dermatophytosis in HIV infected patients [28,33,34].

Microsporium species was another common dermatophyte isolated. This is also a common dermatophyte seen in HIV patients from previous studies [31,35]. It occurs in severe immunosuppression and can be invasive.

*Aspergillus spp* was isolated in some of the HIV infected patients with dermatophytosis. However, this organism is not commonly associated with dermatomycosis in HIV. It may be an incidental finding or a contaminant [36].



*Penicillium spp* Were also isolated in some of the patients. These may either be due to the contamination, increased susceptibility to non-dermatophyte infections in HIV infected persons due to immunosuppression or environmental factors that favor the growth of non-dermatophytic fungi.

## 5. CONCLUSION

This study was carried out to determine the prevalence and clinical variations of the various types of dermatophytosis among HIV seropositive patients seen in Port Harcourt, southern Nigeria.

A significantly higher prevalence of dermatophytosis as well as other skin lesions was observed in the HIV positive cases when compared to the control and most of the patients had advanced HIV infection as evidenced by low CD4 cell count (below 200). Thus it can be concluded that the occurrence of dermatophytosis in HIV infected persons is positively associated with the degree of immunosuppression.

The age group with the highest prevalence of dermatophytosis is the 21-40 and 41-60-year age group. Males have a higher prevalence than females.

The various atypical dermatophytic lesions found in HIV infected persons as reported in other studies were not commonly seen. Most of the skin lesions seen in this study were not much different from the classical lesions seen in HIV seronegative persons with the exception of 2 cases of disseminated and atypical presentation of tinea corporis. Proximal white subungual onychomycosis, said to be pathognomonic of HIV/AIDS was not seen in any patient enrolled for this study.

The commonest aetiologic agents for dermatophytosis in the group of HIV infected patients studied are *Trichophyton spp* and *Microsporum spp*. Which are known to be common aetiologic agents of dermatophytosis in HIV infected patients from previous studies. Other fungi that were commonly isolated include *Aspergillus spp*, and *Penicillium spp*. But these are of doubtful significance.

## CONSENT

It is not applicable.

## ETHICAL APPROVAL

It is not applicable.

## COMPETING INTERESTS

Authors have declared that no competing interests exist.

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