

INCIDENCE OF DERMATOPHYTE INFECTIONS AMONGST SOME OCCUPATIONAL AND SELECT GROUPS IN JOS.

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Fifty-nine Agro farm workers, 265 inmates from Jos main prison, 60 hair weavers and 40 car washers were examined in Jos for dermatophyte infections. Dermatophyte isolates included *Trichophyton* and *Microsporum species*. The highest infection rate of 75% was recorded among the farm workers with toeweb infections due to *T. mentagrophytes* and *M. canis*. 25% of the other infections were from the groin region due to *T. tonsurans* and *T. mentagrophytes*. Fifty-nine percent of infection by *T. mentagrophytes* in prison inmates was restricted to the groin region. Other species of fungi isolated from the inmates were *Trichosporon cutaneum* and *Aspergillus niger*. Among the car washers tinea manum, ringworm of the hand, and interdigital infections due to *T. mentagrophytes* were observed. There was no visible infection among either the female hair weavers or the female prison inmates.

Keywords: Dermatophytosis, *T. mentagrophytes*, *T. tonsurans*, *M. canis*, *Tinea pedis*, *Tinea cruris*.

INTRODUCTION

Cutaneous fungal infections caused by dermatophytes and commonly known as ringworm infection have been known to be occupationally acquired, as reported by Philpot (1) and Ogbonna *et al* (2). Such infections have been found to be common among anthropophilic or human species. The characteristic among such species is that they are associated with community living and the spread of such infections require close human contact. This might occur as a result of communal use of certain facilities such as baths (3), combs, brushes and articles of clothing (4). Incidence of ringworm infections through such sources could then be found among workers who share working boots and overalls such as coal miners, factory workers, camp and prison

inmates. It has even been reported in families by English (5) where overcrowding and concentrated use of common facilities result in infections. *Tinea pedis* (ringworm of the toeweb) could be spread through desquamated scales adhering to moist surfaces such as bathrooms or changing room floors (6).

Zoonosis is found in workers whose occupation lead to contact with infected animals or through contaminated working equipment. Such workers could include herdsmen (2). Hairdressers and barbers also run the risk of infection through infected hair and scalp of their customers. The combined effect of host factors, moisture, warmth, duration of exposure to pathogen and other environmental stresses have been found by Gentles and Holmes (7), to

play important role in the initiation and establishment inflection within a community.

This study was undertaken to report on the first survey of incidence of dermatophyte infection and environment effects among selected occupational groups in the Jos Plateau of Nigeria.

MATERIALS AND METHODS

Study population

The workers were agricultural farm workers from Zalaki farm about 25 km from Jos metropolis, car washers and hair weavers from within Jos. In addition, inmates of Jos main prison were also examined. The farm workers were selected due to their proximity and contact with the animals as possible source of infection. The hair weavers were examined owing to their possible handling of hairs of their infected customers, while the car washers could be exposed to particles of soil adhering to dirty cars, which could contain spores of dermatophytes. The prison inmates were selected because they are exposed to over-crowding and poor environmental sanitation conditions. All sampling was carried out between September and November 1991.

The climate of Jos Plateau is peculiar to itself in Nigeria. There is Savannah woodland vegetation and temperate climate quite

different from the hot humid parts of other parts of Northern Nigeria. The geographical location confers on it Mediterranean climate conditions with dry cold weather and very low humidity.

Specimen collection and processing

Fifty-nine animal farm workers whose ages were between 25-45 years were sampled. Their bodies were thoroughly examined for the presence of cutaneous dermatophyte infections. Lesions remotely resembling fungal infections were cleaned with 70% alcohol and scrapings were then collected from affected body areas with the aid of sterile blade into sterile paper packets, which were then transported to the laboratory for further fungal analysis. The scrapings were cultured on Sabouraud Dextrose Agar supplemented with 0.05 mg/ml chloramphenicol and 0.5 mg/ml cycloheximide in order to suppress growth of bacterial contaminants. Cows on the farm were examined as possible source of human infection among the farm workers. Tufts of hair were collected from infected cows in paper wrappers and cultured for the presence of keratinophilic fungi using the "hair baiting" technique as described by McKenzie. This involved the use of sterile petri dishes, which were half-filled with soil that have been sterilized by autoclaving at 121°C

for 30 minutes for three successive times. The infected hairs from the cows were then sprinkled on the sterilized soil after the soil has been sufficiently moistened with sterile distilled water. The petri dishes were incubated at room temperature in the dark by placing them in closed cupboard.

In Jos main prison, 265 male inmates whose ages range from 18-70 years were thoroughly examined. Scrapings were collected from the affected parts of the body after cleaning the area with 70% alcohol. The scrapings were plated out on Sabouraud Dextrose Agar containing appropriate antibiotics as in the case of the farm workers.

In the case of the 60 female weavers and 40 car washers whose ages range from 30-45 years respectively, bodily examination was only restricted to areas of the body not covered by clothing due to the outdoor nature of their jobs. Skin scrapings collected from interdigital infections of the car washers were subjected to the same treatment for the isolation of dermatophyte fungi as described for farm worker above.

The resultant culture plates from all the sampling except those cultured on sterilized soil were incubated at 37°C and examined on daily basis for the presence of dermatophytes.

The dermatophytes that appeared mainly after 10-14 days were subjected to series of subculturing until pure cultures were obtained. The isolates were then identified with the aid of the microscope and existing stock cultures. References were made to Rebel and Taplin (8); Rippon (9); Campbell and Stewart (10). Wherever necessary, slides cultures were made. Analysis of variance was used in the interpretation of the results.

RESULTS

The dermatophyte from the various occupational groups as shown Table I included *Trichophyton* and *Microsporum* species. *Trichophyton tonsurans* observed in toe-web infection among the farm workers was also isolated from one of the cows. Among the prison inmates, out of a total of 41 positive cultures, 9 (21.95%) were due to infection caused by *T. mentagrophytes* and 7 (17.07%) by *T. cutaneum*. All infections were recorded among the male inmates, but none in their female counterparts and female hairdressers. In the case of the car washers, only interdigital infections caused by *T. mentagrophytes* were recorded.

Table 1: Distribution of Dermatophytes and related fungi amongst occupational and select groups in the Jos, Plateau State.

| Organisms | SITES OF INFECTION | | | | | | | | | | TOTAL |
|------------------------------------|--------------------|-----------|----------|-----------|----------|----------|------------------|----------|-----------|----------|-----------------|
| | GROIN | | TOE-WEB | | NAIL | | FOLD OF BUTTOCKS | | SHOULDERS | | |
| | P.I | F.W | P.I | F.W | P.I | F.W | P.I | F.W | P.I | F.W | |
| <i>Trichophyton mentagrophytes</i> | 2(4.87%) | 1(8.33%) | 0 | 3(35.0%) | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| <i>Trichophyton tonsurans</i> | 0 | 2(16.66%) | 0 | 2(16.66%) | 0 | 0 | 0 | 0 | 0 | 0 | 6 |
| <i>Microsporon canis</i> | 0 | 0 | 0 | 2(16.66%) | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| <i>Trichosporon cutaneum</i> | 7(17.07%) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 |
| <i>Aspergillus niger</i> | 3(7.31%) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 |
| <i>Pityosporum</i> | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 5(12.19%) | 0 | 5 |
| <i>Candida</i> | 2(29.26%) | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| <i>Mucor sp</i> | 0 | 0 | 0 | 2(16.66%) | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| <i>Dermatitis</i> | 0 | 0 | 0 | 0 | 0 | 0 | 10(24.39%) | 0 | 0 | 0 | 10 |
| TOTAL | 14 | 3 | 0 | 9 | 0 | 0 | 10 | 0 | 5 | 0 | 41(100%) |

KEY: P.I. = Prison inmates,
F.W. = Farm Workers

Table 2: Analysis of Variance for data on distribution of dermatophytes and related fungi amongst Zalaki Farm Workers

ANOVA

Source of Variations

| | SS | df | MS | F | P.Value | Fcrit |
|--------------|---------------|-----------|-------|-------|---------|-------|
| Rows | 0.800 | 3 | 0.267 | 2.285 | 0.357 | 3.490 |
| Columns | 15.300 | 4 | 3.825 | 17.00 | 0.000 | 3.259 |
| Error | 2.700 | 12 | 0.225 | | | |
| TOTAL | 18.800 | 19 | | | | |

Multiple Range Value = 0.129

Table 3: Analysis of Variance for data on distribution of dermatophyte and related fungi amongst Jos Prison Inmates.

ANOVA

Source of Variations

| | SS | df | MS | F | P.Value | Fcrit |
|--------------|----------------|-----------|--------|-------|---------|-------|
| Rows | 18.971 | 6 | 3.162 | 0.377 | 0.886 | 2.508 |
| Columns | 66.971 | 4 | 16.743 | 1.999 | 0.127 | 2.776 |
| Error | 201.029 | 24 | 8.376 | | | |
| TOTAL | 286.971 | 34 | | | | |

Multiple Range Value = 3.419565

DISCUSSION

The results obtained have shown that infection with dermatophyte species is an occupational hazard. This agrees with previous findings from other investigators (2,6,11). Continuous exposure of the farm workers to infected cows could result in their being infected with dermatophyte species that are zoonotic. The farm workers at Zalaki had 75.0% rate of interdigital infections. The conditions of service could have enhanced this high infection rate among the workers. The workers were observed to share pithead shower facilities at the end each day's work. Dermatophytes have been isolated from floors of pithead baths, swimming pools and changing rooms (3). English (5) has also observed that fungi have been known to survive for months in shed skin scales even after several laundering of wool. Also the use of alkaline soap could have enhanced the spread of infection, among the community. In a survey of a naval establishment in Cranston England, Broughton (6) found that *tinea pedis* was particularly common among seamen experiencing much desquamation due to the use of alkaline soap. It would therefore appear that the communal use of shower facilities, the use of common overall and soap could have all played

significant roles in the spread of ringworm infections amongst those workers. Moreover, the use of heavy footwear in damp hot weather condition may also have provided suitable environment for their infection (11).

The dermatophyte species, *T. mentagrophytes* and *T. tonsurans* isolated from the workers are known anthropophilic species not restricted to any geographic region. However, the isolation of *T. tonsurans* in one of the infected cows is worthy of note since this anthropophilic species has not been listed as a zoophilic and neither has it been isolated from an animal. Its mode of transmission though uncertain could have been from man to animal or vice versa. Infections from infected animal have been known to be acquired from building or equipment contaminated by contact with infected animals, while sources of infection of farm animals could include barns, fences and soil. Infections among the prisoners were mainly in the groin accounting for 58.53% of total infections. *Tinea cruris* has been considered an infection of sedentary people and to be more common among males than females. This could account for the non-isolation of species of these fungi from the Jos female prison inmates (7.8%) in view of the prevailing environmental conditions of over-crowding, poor personal hygienic and nutritional conditions. The dry low humidity of the Jos Plateau could have contributed to the low infection rate, as it reduces sweating, which reduces ringworm infection to the barest minimum.

This can be compared to situations in India where *Tinea corporis* and *Tinea pedis* are uncommon but *Tinea cruris* particularly of the lower covered waistline and groin assumes particular clinical significance due to the not humid climate of the region (12).

Ringworm infections were not recorded among the female hair weavers. The absence of infection among them in spite of their handling and association with people's hair could be due to the fact that the hair weavers wash their hands after attending to each customer, coupled with the age range of their customers who were found to be adults between the age range of 20-60 years. *Tinea capitis* is an infection that is common among children, the highest incidence occurring between the ages 4-14 years. The risk of contracting infections from other parts of the client's body is reduced, as bodily contact is minimal.

The constant exposure of car washers to water and use of different types of detergent must have been predisposing factors to their *tinea pedis* and *tinea manum* infection.

REFERENCES

1. Philpot CM. Some aspects of the epidemiology of tinea. *Mycopathologia*. 1977 ; **62**:3-13.
2. Ogbonna CIC, Enweani IB, Ogueri SC. The distribution of ringworm infections amongst Nigerian nomadic Fulani herdsmen. *Mycopathologia*. 1986 ; **96** : 101-106.
3. Ajello L, Getz ME. Recovery of dermatophytes from shoes and shower stalls. *J. Invest. Dermato*. 1954 ; **22** : 17-21.
4. Clayton Y, Midgeley G. A new approach to the investigations of scalp ringworm in London School Children. *J. Clin. Path.* 1968 ; **21** : 291.
5. English MP. *Trichophyton rubrum* infections in families. *Brit. Med. J.* 1957 ; **11**:744-746.
6. Broughton RH. Reinfection from socks and shoes in *tinea pedis*. *Brit. J. Dermato*. 1955 ; **67** : 249-254.

7. Gentles JC, Holmes JG. Feet ringworm in coal miners. *Brit. J. Industr. Med.* 1957 ; **14**:22- 29.
8. Rebel C, Taplin D. Dermatophytes: Their recognition and identification. Univ. of Miami Press, Florida, U.S.A Coral Gables : 1970.
9. Rippon JW. Medical Mycology. The pathogenic fungi and the pathogenic Actinomycetes. 2nd edition, W.B. Saunders Company, Philadelphia, 1974.
10. Campbell M, Stewart J. The Medical Mycology Handbook. John Wiley and Sons incorporated, New York, 1980.
11. Allen A, Taplin D. Epidermis *Trichophyton entagrophytes* infections in servicemen; source of infection, role of environment, host factors and susceptibility. *JAMA.* 1973; **226** : 864-867.
12. Desai SC. Epidemicity and clinical features of *Trichophyton rubrum* in the Tropics. *Dermato. Int.* 1966 ; **5** : 222-224.
13. Randhawa HU. An epizootic of dermatophytosis caused by *Trichophyton simii* in poults. *Sabouraudia.* 1973 ; **11** : 1-3.
14. Klobuscicky M, Buchvald J. Workmen Keratinophiler Pilze cut unbeleuten organischen material in der umgebung von *Trichopyton verrucosum* infiziertens kalbern. *Mykosen.* 1976 ; **19** : 124-127.