ORIGINAL ARTICLE

# FREQUENCY OF TINEA PEDIS IN MILITARY RECRUITS AT DERA ISMAIL KHAN, PAKISTAN

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## ABSTRACT

**Background:** Tinea pedis is the most common fungal infection especially prevalent in certain groups. The objective of this study was to determine the frequency of tinea pedis and its predisposing factors in the military recruits.

**Material & Methods:** This cross-sectional study was conducted at Combined Military Hospital, D.I.Khan, from March 2012 to September 2012. A random sample of 350 individuals was selected out of individuals who were undergoing initial military training. Clinical examination, microscopic examination of scrapings from suspected lesions to see fungal hyphae and subsequent culture was done for species identification. Findings were recorded on a performa. Data was analyzed using SPSS version 10.0.

**Results:** The mean age of subjects was 18.57±1.02 (16-23) years. On clinical examination tinea pedis was suspected in 34 (9.71%) out of 350 subjects. A total of 10 (2.8%) individuals were found to have positive fungal hyphae while 14 (4%) were culture positive for trichophyton. Out of 14 positive cultures, 8 yielded growth of *Trichophyton mentagrophytes*, 5 *Trichophyton interdigitale* and one yielded *Trichophyton rubrum*. Predisposing factors were occlusive footwear for >8 hours/ day in (96%), history of excessive sweating in (7.7%), history of fungal infection of feet during last 6 months in (3.4%) and fungal infection of nails during the last 6 months in (2.8%).

**Conclusion:** The prevalence of tinea pedis in Pakistani military recruits is low. Occlusive footwear for more than 8 hours a day is the major risk factor. Excessive sweating and history of previous fungal infection are also risk factors.

**KEY WORDS:** Mycosis; Athletes foot; Tinea pedis; Trichophyton infection.

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## INTRODUCTION

Tinea pedis or athletes foot is a dermatophytic fungus infection involving the feet or toes. Common pathogens include three anthropophilic species namely Trichophyton rubrum, Trichophyton mentagrophytes and Epidrmophyton floccosum. Trichophyton violaceum has also been associated with intractable infections.[1] Moreover, in the tropical and subtropical areas, Candida and some non-dermatophyte molds have prominently effaced.[2] Common presentations revolve around the interdigital (intertrigenous), hyperkeratotic scaly (Moccasin-type), vesiculobullous, acute ulcerative and pustular types. Diagnosis is based on clinical assessment and mycology studies.[3]

Teenage adults are the most commonly affected. Etiological factors include communal group residencies viz a viz living in military abodes, refugee camps, nomadic lifestyles and sports facilities involving 24/7 sharing of essential facilities e.g. washing facilities like communal baths, showers, or pools. Internationally, the prevalence of tinea pedis have been assessed in many groups as part of general dermatosis[1,4,5] with rates varying from 2.4% to 27.3%.[7,8]

In armies around the world, it has been observed that superficial fungal infections including tinea pedis are a major health problem.[8] The factors that have been studied in acquiring tinea pedis include; wearing of occlusive foot ware for more than eight hours (96.6%), physical activities (training and marching) more than one hour a day (87.4%), use of communal shower (79.8%), previous tinea pedis (26.9%),[9] attendance of swimming pool 8.8%, presence of hyperhidrosis (9.8%),[6] onychomychosis (30.5%) and mosque attendance (43.2%).[10] These factors render them to acquire the disease which leads to professional morbidity like inability to wear boot and lack of active participation in physical activities and duties.

This study was designed to assess the frequency of tinea pedis and predisposing factors amongst

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the military recruits undergoing initial training with a view for corrective communal action.

## MATERIAL AND METHODS

This cross-sectional study was conducted in Dermatology Unit of Combined Military Hospital, Dera Ismail Khan, Pakistan from March 2012 to September 2012. A sample of 350 healthy male recruits who were undergoing military training in two military centers of Dera Ismail Khan i.e. Defense Services Guards Centre and Military Police Centre was selected and included in the study by lottery method. A *priori* power analysis based on previous studies involving a similar ambulatory population suggested that this number of subjects would be adequate for this cross-sectional study. Subjects with known atopy (atopic dermatitis, allergic rhinitis, asthma) and anatomical anomalies of toes were excluded from the study.

After a careful history, recruits were subjected to dermatological examination for the presence of disease. Suspicion of tinea pedis was raised on the finding of cutaneous lesions such as erythema, scaling, fissuring, maceration, vesicles, bullae, pustules and hyperkeratosis presenting on inter-digital, sole, and dorsum of feet. Findings were recorded on a proforma. Skin scrapings were taken from suspected lesions and they were kept in 10% KOH preparation overnight and then microscopic examination was carried out for the presence of fungal hyphae. Skin scrapings were also inoculated on plain Sabouraud's dextrose agar (SDA) (Oxoid, UK). All the plates were sealed in polythene zippers, incubated at 22 °C for two weeks and examined twice weekly for any growth. In case of positive growth, species identification was done by colony morphology and lactophenol cotton blue preparation.

Age in years, occlusive foot ware for >8 hours/ day, history of excessive sweating, history of fungal infection of feet during last 6 months and nail infection (fungal) during last 6 months were demographic variables. Clinical suspicion of tenia pedis, microscopy for fungal hyphae, and culture of trichophyton were the research variables. Age, a quantitative variable, was analyzed for mean, standard deviation and range. All other qualitative variables were analyzed for frequency and percentages using SPSS 10 (SPSS Inc., Chicago, Illinois).

## RESULTS

The mean age of subjects was 18.57±1.02 (16-23) years. Frequencies and percentages of predisposing factors are given in Table 1.

On clinical examination tinea pedis was suspected in 34 (9.71%) out of 350 subjects. A total of 10 (2.8%) individuals were found to have positive fungal hyphae while 14 (4%) were culture positive for trichophyton. All the positive fungal hyphae specimens yielded growth on culture. Out of 14 culture positive growths, Trichophyton mentagrophytes was the dominant species causing tinea pedis. (Fig. 1)

**Table 1: Predisposing Factors in 350 subjects with Tinea Pedis.**

| S.No. | Predisposing factors for Tinea pedis | Frequency | Percentage |
|---|---|---|---|
| 1 | Occlusive foot ware for >8 hours/ day | 336 | 96 |
| 2 | H/O excessive sweating | 27 | 7.7 |
| 3 | H/O fungal infection of feet during last 6 months | 12 | 3.4 |
| 4 | Nail infection (fungal) during last 6 months | 10 | 2.8 |

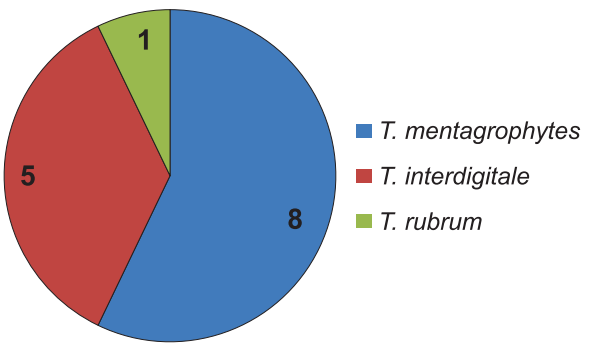


Figure 1: Frequency of different species of Trichophyton causing Tinea pedis

All the individuals were asymptomatic at the time of examination. Six subjects showed lesions on right foot while eight were having on left foot. Single web space was involved in nine subjects whereas five subjects were manifesting disease in two web spaces. The most common web spaces involved were third and fourth interdigital spaces. All subjects were having interdigital type of tinea pedis of mild nature manifesting in the form of eythema, whitening of the intertigenous skin and mild scaling. No superadded infections, id reaction, cellulitis, and onychomycosis were seen in any of the diseased subjects.

## DISCUSSION

Tinea pedis is the most common dermatophyte infection worldwide and its prevalence is continuously increasing. In 1938, 3.8% women and 5% men were manifesting this infection while a recent German study "Foot Check Study" showed the prevalence

to be 31.6%. Certain professions including military service are at high risk of acquiring this infection.[11]

The majority of studies in a community on prevalence of tinea pedis are hospital-based in which patient request for skin examination and specific treatment while surveys on selective group of subjects (coal miner, marathon runners, etc) are limited. Our study provides an estimate of tinea pedis infection among recruits undergoing military training. Tinea pedis was found in 4% of the individuals. All individuals under study were male military recruits.

Ingordo et al[6] studied superficial mycoses in 1024 young cadets from the Italian Navy Petty Officers School in Toronto. The subjects were consecutively followed over a period of 4 month in 2002 for the development of suspected lesion of tinea pedis and subjected to mycological analysis. The study included both males and females. Tinea pedis was mycologically confirmed in 3.2% out of 12.1% clinically suspected subjects. The study also assessed the association of few factors that might be incriminated in causation of tinea pedis. The affected subjects with tinea pedis relate common use of 'gummed' rubber sole (at least 5 times a week) in 40%, sport practice (at least twice a week) in 70%, presence of hyperhidrosis in 10%, history of previous superficial infection in last 6 months in 10% and marching (at least 1 hour/ day in last week) in 60%. In our study the prevalence of tinea pedis in military recruits is comparable to the above results while observation on the association of the assessed factors was also similar.

Ingordo et al performed a survey on 1396 young men still not drafted of age 18-28 years at the Italian Navy Recruitment and Training Centre and observed much lower prevalence (7%) of tinea pedis before starting training.[12] This study although not comparable with the military population living in a community but show the rise in occurrence of tinea pedis after starting training as established in other studies.[6,7]

Ingordo et al in 2000 concluded 2.4% prevalence of tinea pedis in another study among 410 male cadets of Petty Officers School of Italian Navy.[7] The lower prevalence as compared to other studies on military men was attributed to better hygienic condition and preventive measures but may be due to different climate and smaller sample size as seen in our study too. In this study they also examined the unawareness of the affected subjects and suggest relevance of even lower prevalence as positive subjects are a reservoir of ring infection.

In 2005 Cohen et al included 223 soldiers of Israel Defense Force from four different locations including 205 men and 18 women and found 27.3% mycological confirmed prevalence of tinea pedis.[8] As the study was conducted during hot and dry summer season the high prevalence might be attributable to climate but it was also found that setting of military training was significantly associated with tinea pedis. The higher prevalence of tinea pedis during infantry training in comparison with lower prevalence of tinea pedis during armor training was observed. Change of shoe microenvironment from cooler, drier foot conditions to hot, humid condition was another important factor thought to be related to higher prevalence of tinea pedis. While poor personal hygiene, length of military training, length of foot occlusion, type of footwear and cross infection during communal bath facilities although important pathogenetic factors but were not significantly associated with tinea pedis. These observations need prospective approach to evaluate the incidence and factors during a military service.

Djeridane et al carried out a study on military personnel including all ranks at Department of Dermatology at Military Central Hospital in Algeria.[10] Their study showed that fungal foot infection was most common in age group of 20-29 years. Moreover 147 (22.6%) individuals were having tinea pedis as it was the most frequent superficial fungal infection among Algerian Military personnel's beside onychomycosis, tinea capitis, pityriasis versicolor and tinea cruris. They also noted high rate of fungal foot infection during summer. Closed footwear and physical exercise are probable contributing factors while communal shower may promote the spread and transmission of tinea pedis. A hospital based study by Rashid et al[13] on 102 children presented with foot dermatitis proved to have tinea pedis in 26.9% cases, prevalent mostly in young boys.

In our study, T. mentagrophytes was the most common fungus isolated on culture. These findings are consistent with a study done by Pérez-González et al[14] published in 2009, in which T. mentagrophytes was the dominant fungus. However, in contrast to a study by Kiraz et al in 2010, in which T. rubrum was the dominant isolate.[15]

## CONCLUSION

The prevalence of tinea pedis in Pakistani military recruits is low. Occlusive footwear for more than 8 hours is the major risk factor. Excessive sweating and history of previous fungal infection are also risk factors.

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CONFLICT OF INTEREST
Authors declare no conflict of interest.
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