

Prevalence of Fungal Skin Infections in Iranian Wrestlers

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- A** Concept / Design
- B** Acquisition of Data
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Abstract

Purpose: Fungal infections are one of the most common skin infections. Athletes, especially in contact sports such as wrestlers are the group at risk of fungal skin infections (FSI). The aim of this study was to determine prevalence of FSI and some effective factors in wrestlers in Tehran, Iran.

Methods: This study was a cross-sectional descriptive study which was conducted in 2009 and subjects were wrestlers of wrestling clubs of Tehran, Iran. In this study the prevalence of FSI and its related factors was collected based on clinical history, physical examination and laboratory tests. We also determined the rate of dermatophytic contamination of wrestling mats. The relationship between independent variables and incidence of fungal infection analyzed by Chi square test and regression analysis.

Results: In this study, out of 454 wrestlers, 111 (24.5%) subjects had suspicious fungal skin lesions on physical examination. The Prevalence of FSI was 8.2% in all of the wrestlers (34.2% of the wrestlers with suspicious lesion). *Malassezia furfur* (50%) and *trichophyton tonsurans* (30%) were the most common causative agents. *Epidermophyton floccosum* (7.5%), *Trichophyton rubrum* (5%), *Candida albicans* (5%) and *Trichophyton mentagrophytes* (2.5%) were other isolated fungi. Eleven wrestling mats (44%) were contaminated with different fungal organisms.

Conclusion: The prevalence of fungal skin infection in Iranian wrestlers is relatively high. Appropriate preventive measures need to be prepared and implemented to reduce incidence of FSI in wrestlers.

Key Words: Wrestling; Sports; Skin Infection; Dermatophytosis; Tinea

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INTRODUCTION

Wrestling is a popular sport in Iran. Besides wrestling specific injuries, sports physician should be awarded about wrestling health problems and related medical conditions including vaccination and immunity status, infections, weight loss and nutritional issues^[1-7]. Dermatophytosis or ringworm is a term that used to describe fungal skin infections (FSI). The ringworm lesions are itchy, red, scaly and often with an active border and commonly seen in trunk, extremities, face and neck^[8,9].

Dermatophytosis can significantly affect wrestling

teams. The National Collegiate Athletic Association Injury Surveillance System of the US (NCAA) reported skin infections as one of the most common injuries in wrestlers and the dermatophytosis is the second most common skin infection^[10]. Prevalence of ringworm in wrestlers has been reported in a range from 20% to 77%^[11-13].

According to wrestlers' beliefs, body to body contact and wrestling mats are the most important transmission ways of ringworm infections^[14]. Previous studies indicate that skin to skin contact is the predominant way of transmission^[11,15]. Some studies suggested wrestling mats have a role in transmission of

FSI [14,16]. Many other reports however demonstrate that wrestling mats have no role on transmission of ringworm infections [15,17,18].

Dermatophytosis is a major health concern among wrestlers. It is also one of the most common causes of absence in training and competitions [10]. The number of wrestlers is increasing in Iran as a native sport. Indeed, there are a few studies to investigate the role of wrestling mats by using a vacuum cleaner as a source of fungus transmission. With considering the above-mentioned issues, present study was designed to 1) determine the prevalence of FSI in wrestlers in Tehran, Iran, and 2) investigate the role of wrestling mats in transmission of FSI.

METHODS AND SUBJECTS

This study was a cross-sectional descriptive study which was conducted between April and November 2009, in Tehran, Iran. Four hundred and fifty-four male wrestlers were enrolled in this study. While considering a prevalence of 27% of ringworm between Iranian wrestlers according to a previous non published study, (confidence interval= 98% and standard error of 2%) a sample size of 300 was calculated. For selection of the study population, in the first step, among 90 active clubs with approximately 12000 wrestlers in Tehran, 25 were randomly selected. The numbers of clubs in northwest, northeast, southwest and southeast were 6, 9, 4 and 6 respectively. A random cluster sampling scheme was incorporated to select 454 subjects among around 1045 wrestlers attending these clubs. A trained physician examined all wrestlers and skin sampling in 111 wrestlers who had suspected ringworm lesions was conducted. Skin sampling was done by different ways depending on the type of the lesion, e.g.; blunt scalpel blade for scraping scaly lesions and scotch tape for sampling plaque-like lesions. Other data including age, weight, training history and mat cleaning habits were recorded using a questionnaire. In addition, wrestlers who had a suspected skin lesion were asked about similar skin lesions in other competitors.

All club mats were washed and disinfected daily using water and 5% household chlorine bleach. Samples from wrestling mats were taken using a vacuum cleaner after practice times and before daily disinfection to increase the chance of finding dermatophytes. The vacuum cleaner was sterilized after each use. Direct microscopic examination of all specimens (skin lesions and wrestling mats) was done using 10% potassium hydroxide. All samples were cultured in Sabouraud's dextrose agar with and without chloramphenicol and cyclohexamide. Cultures were incubated for 30 days at room temperature. Positive cultures were identified by the macroscopic and microscopic appearance of the colonies.

Effectiveness of this method in isolating the dermatophytes has been consistent [19]. Diagnosis of fungal skin infection in the wrestlers and fungal contamination of the mats were confirmed if the result of smear and or culture was positive.

Study protocol was approved by ethics committee of Tehran University of Medical Sciences, and informed written consent was obtained from subjects prior to entering the study. This research has been supported by Tehran University of Medical Sciences & health services grant.

Statistical analysis was done using SPSS version 16. Chi-Square and analysis of variance was used to compare differences between variables.

RESULTS

The mean age of 454 male wrestlers were 18.1 ± 0.7 years (range: 8 - 58 years). The demographic characteristics of the subjects are shown in Table 1.

One hundred and eleven (24.5%) wrestlers had suspicious skin lesions. Thirty eight wrestlers (8.4%) had FSI. The rate of FSI in wrestlers with a suspicious skin lesion was 34.2%. *Malassezia furfur* (50%) and *trichophyton tonsurans* (30%) were the most common fungal organisms. *Epidermophyton floccosum* (7.5%), *trichophyton rubrum* (5%), *candida albicans* (5%) and *trichophyton mentagrophytes* (2.5%) were other isolated fungi.

Table 1: The age, weight and year of wrestling training of subjects (n=454)

Parameter	Mean (SD)	Minimum-maximum
Age (year)	18.1 (0.7)	8-58
Weight (Kg)	66.2 (16.2)	28-137
Year of wrestling training	2.9 (4.0)	0-43

SD: Standard Deviation

Prevalence of skin infection in wrestlers less than 20 years old was 24.5%, while this prevalence was 12% in wrestlers more than 30 years. Regression analysis showed prevalence of FSI reduced with age and there is a negative correlation between age and fungal infection [$F_{(1,24)} = 0.02$, R-Squared = 0.0001].

Another finding was a significant association between FSI in wrestlers who had contact with other competitors with skin lesions ($P=0.01$). Indeed, wrestlers without a previous history of skin infection had a significantly higher prevalence of FSI than others ($P=0.005$).

Prevalence of FSI was lower in wrestlers who wore sandals in the bathroom (22.3% vs 30.6%). This factor had a borderline positive association with FSI ($P=0.06$). Other personal hygiene factors didn't have any effect on FSI. There is no significant association between FSI and following factors: educational level, weight, contact to animal pet, use of doping or complementary agents, skin trauma, number of sport traveling and use of body building advice in sport club.

Twenty-five wrestling mats from 25 clubs were cultured. Eleven wrestling mats (44%) were contaminated with different fungal organisms including, epidermophyton floccosum (4/11), trichophyton mentagraphytes (4/11) and trichophyton rubrum (3/11). We did not find any association between ringworm and wrestling mats. All club mats were daily washed and disinfected using water and 5% household chlorine bleach.

DISCUSSION

One of the most important health problems in athletes is infectious diseases. The risk of transmission of blood borne infection and skin infection are higher in high

contact sports including wrestling than moderate and low contact sports^[1-4].

In the present study, prevalence of ringworm in Iranian wrestlers and dermatophyte contamination of wrestling mats as a possible source of contagion and effective factors were investigated. Skin infection is an important health problem in wrestling and a common cause of training and match disruption among wrestlers^[1,10,14]. Herpes simplex and ringworm are the most common type of skin infections in wrestlers^[10].

Most reports on ringworm in literature are case reports of outbreaks of tinea corporis gladiatorum^[20-22]. Few other studies have reported prevalence of ringworm in wrestlers without a known epidemic^[17,24-27]. Similarly in our findings, in a review of 1151 American male wrestlers between 1988 and 2004, 22.1% of wrestlers had ringworm^[10]. In A cross-sectional study in 29 American wrestlers, tinea corporis gladiatorum was reported in 24% (7/29) wrestlers^[17]. Prevalence of ringworm has been reported 19.2%^[26], 20%^[27], 22%^[23], 27%^[24] and 35%^[25] in other studies. Contrary to this study, a cross-sectional survey of 411 Iranian wrestlers in 2005, showed a higher prevalence of ringworm (195/411 = 47.4%)^[1]. Large differences in prevalence of ringworm in wrestlers in different studies may be due to existence of an outbreak of ringworm in the study period and different characteristics of study population. Lower prevalence of ringworm has been reported in amateur participants and female athletes in comparison with professional athletes that have had higher level competitions and exercise.

The prevalence of ringworm is higher in younger wrestlers^[17,23]. Basiri-Jahromi et al^[20] showed that about two third (72.7%) of the wrestlers with ringworm were between 10 to 20 years. A higher rate of dermatophytosis in wrestlers younger 20 years was found in our study too. This finding could be explained by spending more time on training and competitions by this age group.

The main route of transmission of FSI is direct skin to skin contact with infected people and fungal skin infection in other wrestlers and family members are known risk factors of FSI in wrestlers [18]. Higher prevalence of FSI in the wrestlers who had contact with the wrestlers with a skin lesion in our study, support this fact. According to Kohl's study [14], 75% of wrestlers believe that wrestling mats have a role on transmission of ringworm. Some studies indicate that wrestling mats are a source of ringworm in wrestlers [14,16]. Despite the high prevalence of fungal contamination on wrestling mats in our study (44%), we did not find any relation between ringworm skin infection in the wrestlers and contamination of wrestling mats. Our result is consistent with the other studies [18,28,29]. There are two explanations for this finding. First, scant number of dermatophytes on the mats may be a reflection of low prevalence of ringworm infection in the wrestler's population. Then they would not be able to induce a clinical infection. As showed in previous studies, only studies with a known outbreak of ringworm were able to isolate dermatophytes from mats [16,30,31]. Second, high frequency mat cleaning might decrease the chance of fungal transmission from the mats [29]. Previous studies did not clearly investigate mat cleaning habits and its role on result of mats samples culture [29]. However, using highly sensitive methods such as the ribosomal internal transcribed spacer (ITS) and polymerase chain reaction (PCR) fingerprinting can improve chance of dermatophytes identification [16,32].

Previous studies reported trichophyton tonsurans as the most common cause of ringworm in wrestlers [15,21,25,30,33]. In the present study, trichophyton tonsurans was the second most common fungus that was isolated from wrestlers. Although a previous study in Iran had shown low prevalence of trichophyton tonsurans in Iranian wrestlers [20]. As trichophyton tonsurans is an anthropophilic dermatophyte [34], higher prevalence of trichophyton tonsurans in the wrestlers in our study

like many other previous studies may be explained by evidence of asymptomatic fungal infection in other wrestlers [13,31] and contamination of wrestling mats or other wrestling equipment.

From several effective factors on FSI, we studied just the role of wrestling mats and some personal hygiene factors (including age, weight, training history) in transmission of FSI. Other personal hygiene factors such as total time of exposures, number of opponents and number of the matches during a specific times (example the last 6 months) and health habits of wrestlers were not considered in this study.

CONCLUSION

The prevalence of fungal skin infection in wrestlers with suspicious skin lesions was 34.2%. *Malassezia furfur* and *trichophyton tonsurans* were the most common fungal organism (50% and 30%). There was a negative correlation between age and FSI in this study. Indeed, there was an association between FSI and contact with other wrestlers who had suspicious skin lesions. High prevalence of ringworm in Iranian wrestlers indicates a lack of effective measures for prevention of this type of infection. Appropriate preventive measures need to be prepared and implemented to reduce incidence of fungal skin infection in wrestlers.

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Conflict of interests: None

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