

Survey on Dermatophytosis in Wrestlers and Its Relationship with Wrestling Mats in Hamedan

Reza Habibipour,*¹ Leila Moradi-Haghgou,¹ Samaiyeh Bayat¹

1. Department of Microbiology, Islamic Azad University, Hamedan Branch, Hamedan, Iran

Article information	Abstract
<p>Article history: Received: 9 Aug 2011 Accepted: 26 Apr 2012 Available online: 10 June 2012</p> <p>Keywords: Dermatophytosis Tinea corporis Tinea gladiatorum Wrestling</p> <p>*Corresponding author at: Department of Microbiology, Islamic Azad University, Hamedan Branch, Hamedan, Iran. E-mail: r_h_p_53@yahoo.com</p>	<p>Background: This study examined the prevalence of <i>Tinea gladiatorum</i> as a superficial dermatophytosis in wrestlers of Hamedan and reviews this infection in the wrestling mats in terms of dermatophytic factors.</p> <p>Materials and Methods: This study was conducted (Oct. 2009 to the end of Sep. 2010) on 1,800 people in 10 wrestling halls. Samples of skin were collected from suspected wrestlers and evaluated via potassium hydroxide. Sterile carpet method (5×5) was also used for sampling from mats surfaces. Common mediums and methods in mycology were used to culture samples and detect grown fungi.</p> <p>Results 44 individuals (2.4%) of the wrestlers were diagnosed with ringworm. A mat (10%) was infected with dermatophytes. Dermatophytic factor isolated from wrestlers and wrestling mats was <i>Trichophyton tonsurans</i> in all cases. Highest rate of infection in terms of weight was weight group above 90 kg, with infection rate of 5.4% and in terms of age, it was age group of 16-21 with infection rate of 2.6%. Most lesions were observed in the upper body areas in neck 21.3% and the least lesions were seen in the leg 8.2%. In this study, proportion z-test) showed a significant difference between the infected and non-infected wrestlers with ringworm in terms of frequent contact of the lesion with the mat surface and recurrence ($p < 0.05$). On the other hand, statistical z-test showed that there is no significant difference between the infected and non-infected wrestlers with <i>Tinea gladiatorum</i> in terms of domestic and foreign travel and for training or competition with rivals, the number of domestic and foreign travels, weight, age, type of bathing, wrestling type, the geographic location of wrestling hall and anatomic location of lesion ($p > 0.05$).</p> <p>Conclusion: Rapid diagnosis and appropriate treatment of dermatophytic infection and observance of health issues of athletes to prevent reduction and interruption of the exercises and competitions are essential.</p> <p>Copyright © 2012 Zahedan University of Medical Sciences. All rights reserved.</p>

Introduction

Several cutaneous diseases have been reported in wrestlers most of which are infections. Herpes simplex infection which is known as herpes gladiatorum has been well documented [1-6]. Ringworm is less recognized in wrestlers [7, 8] and it has been reported by several names such as *Tinea corporis gladiatorum*, *Trichophytosis gladiatorum*, *Tinea gladiatorum* and wrestlers' ringworm [9-11]. *Tinea gladiatorum* is very common among wrestlers and other sports in which there is direct physical contact during exercise or competition [12]. Wrestlers acquire body ringworm through direct contact with an infected person or contaminated sport instruments and lesions are more created in body parts such as head, neck and upper body [13]. The cause of *Tinea gladiatorum* is mentioned to be rather *Trichophyton tonsurans* which is a anthropophilic microorganism [14, 15].

However, it seems that the two fungi *Trichophyton tonsurans* and *Trichophyton rubrum* are the main factors causing ringworm. It is difficult to culture fungus from wrestling mats, but the two reviews in France [16] and Sweden [17] isolated *Trichophyton tonsurans* from the mat. 44.1% prevalence of *Tinea gladiatorum* was reported

among 18 Spanish wrestlers and in German, 31 cases were also reported among wrestlers of 7-17 years old [18, 19] and in 2002, Adams showed an increase in creation of dermatophytic infections in American wrestlers [20] and Ergin et al. showed 66.8% prevalence in young Turkish wrestlers [21]. Wrestling is one of the most popular sports among the youth in Hamedan. Hamedan county, as the center of Hamedan province, is located in the West of Iran. As it mentioned, wrestlers' ringworm has been reported in most regions of the world, but little information is available about the prevalence of this disease in Iranian wrestlers. This study aims to determine the prevalence of *Tinea gladiatorum* among wrestlers of Hamedan and identify causative factors as well as its relationship with the infected wrestling mat.

Materials and Methods

In this cross-sectional study which was conducted for a year (October 2009 to September 2010) a total of 1800 wrestlers were examined. Laboratory diagnosis was performed by direct examination via potassium hydroxide 20% and culture on Sabouraud's glucose agar medium with

0.05 g/l chloramphenicol and 0.4 g/l cycloheximide (Scc); Sabour'd's dextrose agar with 0.05 g/l chloramphenicol (Sc) and dermatophyte test medium (DTM). Sterile carpet method was also used for sampling from the surface of the mats (5×5). The collected samples were separately cultured in mycology laboratory of Islamic Azad University of Hamedan, under sterile conditions on the mediums Scc, Sc and DTM and grown fungus were identified by conventional methods in mycology. There are no specific limitations to conduct this study, but in some cases, some of the wrestlers might have been absent in the day of sampling.

Results

There are 10 active wrestling halls in Hamedan where 1800 wrestlers were studied which, 44 of whom (2.4%) were infected by dermatophyte. Proportion Z-test with 95% confidence revealed that there is no statistically significant difference for infection with dermatophyte between age groups and the type of wrestling (Greco-Roman and freestyle), having domestic and foreign travels, the number of travels and the type of bathing. However, the infection in the weights above 90 kg was greater than other weights. But in other cases, infection did not follow weight gain (table 1).

Depending on the anatomic location of the lesions, although the number of lesions in the neck and shoulder areas was higher than other areas, it was not significantly different according to the proportion z-test. However, there was a statistically significant difference for re-infection between people who have experienced the disease once and those who did not show recurrence (table 2).

Isolated dermatophytosis of all samples was *Trichophyton tonsurans*, all isolated saprophyte fungus of 10 wrestling mats listed in table-3. Meanwhile, a case of *Trichophyton tonsurans* (10%) also obtained from a wrestling mat.

Table 1. Absolute and proportional frequency distribution of infected and non-infected wrestlers to dermatophytosis by weight in the wrestling halls in the city of Hamedan, 2009-2010

Dermatophytosis Weight(kg)	Positive N(%)	Negative N(%)	Sum N(%)
30- 50	9 (1.9)	456(88.1)	456 (100)
51- 70	15 (2.2)	663(77.8)	678 (100)
71- 90	13 (2.7)	460(77.3)	473 (100)
> 90	10 (5.4)	177(94.6)	184 (100)
Sum	44 (2.4)	1756(97.6)	1800 (100)

Table 2. Absolute and proportional frequency distribution of infected and non-infected wrestlers to dermatophytosis by history and recurrence of the disease in the wrestling halls in the city of Hamedan- 2009-2010

Dermatophytosis Weight	Positive N(%)	Negative N(%)	Sum N(%)
Yes	41 (43.6)	53 (56.4)	94 (100)
Not	3 (0.2)	1703(99.8)	1706(100)
Sum	44 (2.4)	1756(97.6)	1800(100)

Table 3. Absolute and proportional frequency distribution of saprophytic fungi colonies isolated from 10 wrestling mats of wrestling halls in Hamedan- 2009-2010

Type of saprophyte	N(%)
Penicillium species	41 (36.6)
Aspergillus species	29 (25.9)
Alternaria	7 (6.3)
Cladosporium	7 (6.3)
Acromonium	4 (3.5)
Sterile mycelium	4 (3.5)
Unknown saprophyte	5 (4.5)
Geotricum	1 (0.9)
Mucor species	3 (2.7)
Cryosporium species	4 (3.5)
Tricosporium	1 (0.9)
Scopulariopsis	1 (0.9)
Rhizopus	1 (0.9)
Tricoderma	1 (0.9)
Fusarium	3 (2.7)

The comparison between direct examination and culture revealed that the sensitivity of direct method is 86.1% compared to cultivation. In other words, false negative in the direct method to culture is 13.9%.

Discussion

The main reason of ringworm of wrestlers' body in this study was *Trichophyton tonsurans*. *Trichophyton tonsurans* is a anthropophilic dermatophyte fungi which was very rare in Iran a few years ago, but unfortunately, the prevalence of this species is currently increasing [22].

The infections caused by anthropophilic species require close contact of humans for the transmission and spread of infection. Thus, in communities such as sports halls, including wrestling halls which have shared instruments like bath, toilet and etc. infection spreads easily so that so far numerous cases of the epidemic and infections caused by dermatophytic anthropophilic species, including *Trichophyton tonsurans*, have been reported as the cause of ringworm of wrestlers' body [23, 24].

In our study of 1800 wrestler cases in 10 wrestling halls in Hamedan, 44 individuals (2.4%) were diagnosed with wrestlers' body ringworm (*Tinea gladiatorum*). The lowest infection rates of the halls (1%) belonged to one of the universities. Wrestlers in this hall were all students and the hall had adequate health facilities. These wrestlers did not practice in any other wrestling hall and none of them had a history of *Tinea gladiatorum*, they neither had a history of sport travel for practice or competition with the domestic or foreign opponent.

Given the above points, also frequent cleaning of wrestling mats of this hall (according to the coach and supervisor of the hall), and lack of isolation of dermatophytes from mat of this hall, low incidence of *Tinea gladiatorum* in this hall is justifiable.

On the other hand, most infections (4.4%) occurred in a hall located in the north of Hamedan. Wrestlers in this hall were often from down-town low-income families. Most of them had little health knowledge and did not visit a doctor for treatment even after having the disease and several lesions. Five dermatophytic colonies were also

separated from this mat. Thus, all mentioned cases had caused this hall to be the most polluted studied hall.

In studies similar to our study that has been conducted abroad, different amounts of infection with ringworm of wrestlers' body have been reported. For instance, Kohl and Martin have reported this infection rate to be 17.5%, Beller and Gessner 75% and Adams, 24% [11, 20, 25] whereas, the average amount of infection resulting from the examination of 10 wrestling halls in our study was 2.4%. The reason for this difference is that the studies abroad are conducted in a small area like a wrestling team or a club. However, our review has been conducted in the scope of a metropolitan city, which is Hamedan.

According to the results of our study, the value of infection in our investigated halls has been variable in a wide range from the lowest amount i.e. 1% to the highest amount i.e. 4.4%. Meanwhile, the infection rate in Hamedan was lower than other provinces and some countries. Previous studies revealed that this disease was common in Hamedan in the past years and had a high percentage and the problem of infection with dermatophytes has been largely resolved through the greater consideration of authorities and awareness of wrestlers and cleanliness.

Trichophyton tonsurans has been the dermatophytes isolated from all samples in our study. In addition, given that in other studies conducted on wrestlers' body ringworm, the factor causing this disease in almost 100% of cases has been *Trichophyton tonsurans* [8, 11, 15, 18, 23, 25] results from our investigation in this case are consistent with the results of other investigations.

In this study, it was revealed that wrestlers' body ringworm is not related to a specific weight or age, so that the statistical test also showed no significant relationship between various weight and age groups of the infected and non-infected wrestlers with this disease. None of the studies carried out abroad has emphasized the variables of age, weight for wrestlers' body ringworm [26].

In our study, most lesions of *Tinea gladiatorum* have been observed in trunk as the frequency of lesions in different parts of body was neck (21.3%), shoulder and waste (18%), arm and forearm (14.8%), chest (13.1%), face (11.5%), ears (8.2%) and legs (8.2%). Of seven *Tinea gladiatorum* lesions in Adams study, 5 occurred in arm, 2 in wrists, one in upper chest and one in foreleg. Of the 76 lesions in Layman study the distribution of lesions on the body was as follows: 28% on the upper part of arm, 21% on the posterior trunk, 21% on the anterior trunk, 18% on the lower part of arm, 11% on the neck and head and 1% on the foreleg [15, 27]. Thus, the results of our study are largely consistent with the results of the study of Adams and Layman. The causes of higher lesions in the upper regions of the body can be for two reasons, one is that these areas do not have any protective covering (according to the type of covering and wrestling clothing) and the other is that these points are in frequent contact with the opponent's body or surface of mats.

Regarding 36 wrestlers (13.5%) who had a history of domestic and foreign travels during which they had practice or competition with domestic and foreign rivals,

results showed that there is no statistically significant difference between infected and non-infected wrestlers in terms of domestic and foreign travels. It means that domestic and foreign travels have had no role in spreading wrestlers' body ringworm.

In our study, there was no significant difference between infected and non-infected wrestlers with *Tinea gladiatorum* in terms of having the history of travels. It should be noted that this lack of statistical association may be due to the fact that athletic travel conditions may be provided for a limited number. Anyway, the role of travel can cause the spread of contagious diseases including dermatophytes. So that Rippon considers traveling as one of the spreading factors of dermatophytic species with outbreak [28].

In our study, most infection of wrestlers was in the northern region (2.6%) according to the geographic area of halls. However, statistical tests showed no significant difference in terms of geographical area. Given the lack of personal hygiene and cleanliness and hygiene of training location, including mats, which we witnessed during sampling. Besides having the greater density of wrestler and wrestling halls in this region compared to the other geographical areas, are another factors causing the greater infection in this area. On the other hand, a mat infected with dermatophytes was in the northern region, which can also be another factor causing the increase of infection.

Despite the fact that in this study, sampling and isolation of dermatophytes from the bathroom in the halls were not of the objectives and actions of our study, 31 patients (2.6%) used the showers in the halls. However, the number of wrestlers using the shower in the halls and which were suffering from dermatophytes was higher than those taking bath at home, but this difference was not statistically significant. Various studies also regarded the use of infected public baths among the reasons of infection with dermatophytes and have isolated the various types of dermatophytes from the bath.

In this study, 41 individuals (43.6%) had a history of treatment and recurrence of disease and the statistical test significant also showed a significant relationship between infection and history of treatment and recurrence and we accepted that inadequate treatment causes reinfection of the person and spread of disease. Kohl showed that 68.7% of wrestlers in a high school in United States relapsed infection after the treatment of wrestlers' body ringworm, which is consistent with the results of our study [12].

The reason of this recurrence is that many patients with wrestlers' body ringworm stopped taking the drug after a series of clinical symptoms disappear. Thus, incomplete treatment leads to the relapse [14].

Stiller et al. present another cause for recurrences of infection, claiming that the head of children and adults has a transition state without clinical symptoms. Thus, these people can act as a reservoir of infection and be considered a cause for recurrence of lesions in the community of wrestlers [8]. In this investigation, the result of direct examination was positive in 86.1% and negative in 13.9%. This is explainable with 5 to 15% negative result of direct examination.

In some studies conducted abroad, *Trichophyton tonsurans* was not been separated from the mats' surface. In this regard, it is different with the results of our research. Isolation of *Trichophyton tonsurans* and bringing up the mat as one of the factors causing *Tinea gladiatorum*, can confirm the statement of Kohl and Lisney claiming that lack of isolation of dermatophytes from the mat cannot be a reason for the lack of their role in the development of wrestlers' body ringworm; because during sampling from mats, no health monitoring is taken based on the absence of disinfection of mats [14]. However, in this study, before sampling from mats, we ensure of no disinfection of mats while coordinating with officials and instructors of halls; then, we start sampling from the mat. Also to increase the possibility of isolation of dermatophytes, the sampling time was chosen right after the end of practice or competition of wrestlers. In addition, isolation of *Trichophyton tonsurans* from the mats in our survey is consistent with Kohl et al. study in Pennsylvania, who regard the mats as the main cause of transmission of wrestlers' body ringworm [12].

To isolate dermatophytic factors from the surface of the mat, the carpet method was used in this study. Many studies have been conducted using the carpet method. Using the carpet method, Kraus et al. isolated some fungus factors from the margins of ponds and bottom of dressing room cabin in Australia [29]. Using the carpet method, Gentile et al. could isolate *Trichophyton*

mentagrophytes, *Trichophyton rubrum* and so many saprophyte fungi in a review in Germany [30].

In this study, by means of carpet method (five colonies) isolated from 1 out of 10 surveyed mats (10%) which is concordant with Hardli and Poisson, because they isolated *Trichophyton tonsurans* from mats. As the only isolated dermatophyte species from wrestling mat was *Trichophyton tonsurans*, hence it could be concluded that it is related to *Tinea gladiatorum* corporis. However, epidemiological and microbiological studies have suggested skin-to skin contact as the main causative agent of transmission; some wrestlers may be asymptomatic carries [8, 11, 15, 31].

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Authors' Contributions

All authors had equal role in design, work, statistical analysis and manuscript writing.

Conflict of Interest

The authors declare no conflict of interest.

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