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Fungal Skin Infections in Beach Volleyball Athletes in Greece

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Abstract: Background/Objectives: Fungal infections, commonly referred to as mycoses, are widespread and affect various parts of the body. Common types of fungal skin infections include tinea pedis, tinea unguim, tinea cruris, tinea versicolor, and tinea manuum. Athletes, in particular, are at a higher risk of contracting these infections due to several factors inherent to their training and competitive environments. Methods: This research examined the incidence, anatomical distribution, and seasonal occurrence of fungal skin infections among beach volleyball athletes in Greece. The study cohort consisted of 785 participants, with an average age of 28.4 years. Variables recorded included gender, the seasonal periods during which athletes might be more prone to injuries, and the specific body areas affected by fungal infections. In addition, training-related data such as weekly training frequency, and daily training duration were collected. Results: Incidence rates correlated in relation to gender: male, tinea pedis ($p < 0.000$), tinea manuum ($p < 0.010$); number of weekly trainings: tinea pedis ($p < 0.000$), tinea unguium ($p < 0.043$), tinea cruris ($p < 0.008$), tinea versicolor ($p < 0.038$), tinea manuum ($p < 0.043$); average hours of daily training: tinea unguium ($p < 0.039$), tinea manuum ($p < 0.039$). Conclusions: Athletic activities often involve exposure to warm, moist conditions that promote fungal growth. Locker rooms, showers, and equipment can harbor fungi, spreading infections among athletes. Understanding these infections is essential for effective prevention and management, as they can impact performance and health if untreated. Proper hygiene, antifungal treatments, and public health measures are crucial to reducing the risk in athletic settings.

Keywords: fungal skin infections; beach volleyball athletes; epidemiology

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1. Introduction

Fungal skin infections, commonly referred to as mycoses, are a significant health concern, especially for athletes involved in sports that feature frequent skin-to-skin contact and exposure to humid environments [1]. These infections are primarily caused by dermatophytes, yeasts, and molds—organisms that thrive in warm, moist conditions [2]. Athletes are particularly susceptible due to a combination of environmental and physiological factors. Prolonged sweating, wearing tight-fitting clothing, and sustaining minor skin injuries all create ideal conditions for fungal proliferation [3]. In sports such as wrestling, soccer, and swimming, where close physical contact and the use of shared facilities are common, the risk of fungal infections is heightened, posing a direct threat to both athletic performance and overall health [4].

In recent years, increasing attention has been paid to fungal skin infections among athletes, as untreated infections not only impair performance but can also progress to more serious systemic health issues [3,4]. While fungal infections have been widely studied in sports with high levels of physical contact, such as wrestling and rugby, the environmental conditions specific to beach volleyball introduce additional risks that are unique to this sport. The outdoor setting, direct exposure to sunlight, and interaction with sand create a microclimate that promotes the growth of pathogenic fungi [5]. Seasonal variations in fungal populations have been observed in beach environments, with warmer temperatures correlating with an increased fungal load in sand [5]. Furthermore, the widespread practice

of walking barefoot on the sand increases the likelihood of exposure to dermatophytes and other fungi, as sand is a known reservoir for fungal pathogens [6,7].

Beach volleyball athletes face an elevated risk of fungal skin infections due to the combination of environmental conditions and the physical demands of the sport. The warm temperatures, high humidity, and frequent contact with sand create an optimal environment for fungal growth and colonization [8]. Athletes in this sport often engage in high-intensity physical activity, which leads to excessive sweating. Combined with the use of tight athletic gear, this fosters a consistently moist environment, conducive to fungal proliferation on the skin [3]. The abrasive nature of sand, which often causes microtraumas and skin abrasions from diving and repeated contact, further exacerbates the risk of fungal colonization and infection by providing entry points for fungi [9]. Despite these risks, research specifically focused on fungal infections in beach volleyball athletes is limited. This gap is particularly noticeable in regions like the Mediterranean, where climates characterized by high temperatures and humidity, such as those in Greece, can further increase the susceptibility to such infections [9]. Addressing this gap is crucial to better understand the prevalence, types, and contributing factors of fungal infections in this athletic population. This study aims to provide insights that will inform both prevention and treatment strategies, specifically tailored to the unique conditions faced by beach volleyball athletes in these environments.

2. Materials and Methods

In this study, an online survey was designed and administered via Google Forms. Prior to launching the survey, a pilot test was conducted to verify the precision and comprehensibility of the questions. Ethical approval for the study was granted by the Research Ethics Committee of the University of West Attica (20 July 2020/app.no.48944) and the Hellenic Volleyball Federation (06 March 2019/app.no.746).

The questionnaire's design and the data collection methods were carefully structured to protect participants' privacy and uphold their dignity. Informed consent was obtained from all participants before their inclusion in the study. In November 2020, the Hellenic Volleyball Federation distributed the Google Forms survey link to athletes via email. The questionnaire gathered demographic data, including gender, and sought information on (a) fungal skin infections, specifically tinea pedis, tinea unguim, tinea cruris, tinea versicolor, and tinea manuum, (b) the season during which the infections occurred, (c) the specific body location of the infections, and (d) details of practice routines, including weekly and daily frequency, in relation to the type of fungal infections reported. A comprehensive dermatologic evaluation confirmed the diagnosis of cutaneous fungal infections. All athletes in the study underwent a clinical examination by a dermatologist, who assessed the presence of fungal infections based on visible signs and symptoms. In all cases, the diagnosis was made following an assessment by their personal dermatologist. It is unknown whether all or some athletes underwent laboratory testing. No athletes included in the study were immunosuppressed due to iatrogenic or infectious causes.

Statistical and Data Analysis

Data obtained from the survey were input into an electronic database created using Excel v16.0. Statistical analysis was performed using IBM SPSS Statistics for Windows, version 26.0. Categorical variables were summarized using absolute (n) and relative (%) frequencies, while continuous variables were described using means (standard deviation, SD) and/or medians (interquartile range, IR). The assumption of normality was evaluated using the Kolmogorov–Smirnov test ($p > 0.05$ for all variables), along with visual inspections of histograms and normal probability plots. Bivariate analyses included the chi-square test and chi-square trend test to assess associations between categorical variables, while the Mann–Whitney U test was used to compare differences between groups for continuous variables. A two-tailed p-value of 0.05 was considered to indicate statistical significance.

3. Results

3.1. Demographic Characteristics and Training Elements

The study sample consisted of 785 beach volleyball athletes. No questionnaires were deemed invalid. Demographic details and training data for the participants are outlined in Table 1.

Table 1. Demographic characteristics and data regarding athletes' training.

Gender	***n***	**%**
Male	329	41.9
Female	456	58.1
Number of weekly training		
Less than 4	697	88.8
More than 4	88	11.2
Average hours of daily training		
Less than 1	12	1.5
1–2	511	65.1
More than 2	262	33.4

Values are presented as *n* (absolute) and % (relative) frequencies, unless stated otherwise.

Among the participants, 329 were male, and the average age was 28.4 years (SD = 9.0). In total, 697 (88.8%), trained fewer than four times per week, while 11.2% trained more frequently. Additionally, 65.1% of the athletes trained for 1 to 2 h per day, 33.4% trained for more than 2 h, and 1.5% trained for less than 1 h.

3.2. Fungal Skin Infections, Season of Appearance, and Body Location

Overall, 219 athletes (27.9%) in the study population reported tinea pedis, 118 athletes (15%) tinea unguium, 118 athletes (15%) tinea cruris, 112 athletes (14.3%) tinea versicolor, and 107 athletes (13.6%) tinea manuum.

In fungal infections, the sites of localization on the body were the upper and lower limbs and the corpus. Specifically,

- Upper limbs: Tinea manuum was observed in 78.8% of cases.
- Lower limbs: Tinea pedis was observed in 68.4%, and tinea unguim in 77.3%.
- Corpus: Tinea cruris was observed in 66.7%, and tinea versicolor in 73.5%.

The summer season was reported as the time with the highest incidence of fungal infections. (see Tables 2 and 3).

Table 2. Fungal Skin Infections (Tinea Pedis, Tinea Unguium, Tinea Cruris).

	Fungal Infections		
	Tinea Pedis *n* (%)	**Tinea Unguium *n* (%)**	**Tinea Cruris *n* (%)**
No	566 (72.1)	667 (85.0)	667 (85.0)
Yes	219 (27.9)	118 (15.0)	118 (15.0)
Season of fungal infections appearance			
Winter	36 (28.1)	36 (52.9)	6 (10.7)
Spring	28 (21.9)	22 (32.4)	6 (10.7)
Summer	96 (75.0)	47 (69.1)	45 (80.4)
Autumn	54 (42.2)	35 (51.5)	15 (26.8)

Table 2. *Cont.*

	Fungal Infections		
	Tinea Pedis ***n*** **(%)**	**Tinea Unguium** ***n*** **(%)**	**Tinea Cruris** ***n*** **(%)**
Body location			
Upper limbs	0 (0.0)	0 (0.0)	16 (26.7)
Lower limbs	78 (68.4)	58 (77.3)	9 (15.0)
Head	0 (0.0)	0 (0.0)	0 (0.0)
Corpus	0 (0.0)	0 (0.0)	40 (66.7)
Palms/Hand	0 (0.0)	9 (12.0)	0 (0.0)
Soles	43 (37.7)	19 (25.3)	1 (1.7)
Face	0 (0.0)	0 (0.0)	0 (0.0)

Values are expressed as *n* (absolute) and % (relative) frequencies.

Table 3. Fungal Skin Infections (Tinea Versicolor, Tinea Manuum).

	Fungal Infections	
	Tinea Versicolor ***n*** **(%)**	**Tinea Manuum** ***n*** **(%)**
No	673 (85.7)	678 (86.4)
Yes	112 (14.3)	107 (13.6)
Season of fungal infection appearance		
Winter	20 (47.6)	14 (38.9)
Spring	15 (35.7)	11 (30.6)
Summer	26 (61.9)	26 (72.2)
Autumn	14 (33.3)	12 (33.3)
Body location		
Upper limbs	6 (12.2)	26 (78.8)
Lower limbs	3 (6.1)	3 (6.1)
Head	8 (16.3)	0 (0.0)
Corpus	36 (73.5)	0 (0.0)
Palms/Hand	1 (2.0)	0 (0.0)
Soles	1 (2.0)	0 (0.0)
Face	2 (4.1)	0 (0.0)

Values are expressed as *n* (absolute) and % (relative) frequencies.

3.3. Differences in the Prevalence of Fungal Skin Infections Between Males and Females

In Table 4, using the chi-square test, it is observed that males, compared to females, exhibited a higher frequency of

- Tinea pedis: 35.3% versus 22.6%, OR = 1.56. This indicates that males are 1.56 times more likely than females to develop tinea pedis.
- Tinea manuum: 17.3% versus 11.0%, OR = 1.57. This indicates that males are 1.57 times more likely than females to develop tinea manuum.

The *p*-value is highlighted in bold where there is a statistically significant difference.

Table 4. Prevalence of Fungal Skin Infections Between Males and Females.

	Gender									
	Female				**Male**					
	No		**Yes**		**No**		**Yes**			
	n	**%**	***n***	**%**	***n***	**%**	***n***	**%**	**X^2 (1)**	***p***
Tinea Pedis	353	(77.4%)	103	(22.6%)	213	(64.7%)	116	(35.3%)	15.253	0.000
Tinea Unguium	388	(85.1%)	68	(14.9%)	279	(84.8%)	50	(15.2%)	0.012	0.912
Tinea Cruris	386	(84.6%)	70	(15.4%)	281	(85.4%)	48	(14.6%)	0.087	0.768
Tinea Versicolor	398	(87.3%)	58	(12.7%)	275	(83.6%)	54	(16.4%)	2.132	0.144
Tinea Manuum	406	(89.0%)	50	(11.0%)	272	(82.7%)	57	(17.3%)	6.567	0.010

3.4. Correlations

Bivariate analyses were conducted (Tables 5–7) with tinea pedis, tinea unguim, tinea cruris, tinea versicolor, tinea manuum as the dependent variables. The independent variables included demographics, number of weekly training, and average hours of daily training.

Table 5. Bivariate analyses using tinea pedis and tinea unguim as dependent variables.

	Tinea Pedis			**Tinea Unguium**		
Characteristic	**No**	**Yes**	***p* Value**	**No**	**Yes**	***p* Value**
Gender			<0.000 [a]			<0.912 [a]
Male	213 (64.7)	116 (35.3)		279 (84.8)	50 (15.2)	
Female	353 (77.4)	103 (22.6)		388 (85.1)	68 (14.9)	
Number of weekly trainings			0.000 [d]			0.043 [d]
Less than 4	254 (77.9)	72 (22.1)		290 (89)	36 (11)	
More than 4	255 (66.1)	131 (33.9)		323 (83.7)	63 (16.3)	
Average hours of daily training			0.124 [d]			0.039 [d]
Less than 1	10 (83.3)	2 (16.7)		10 (83.3)	2 (16.7)	
1–2	319 (69.0)	143 (31.0)		387 (83.8)	75 (16.2)	
More than 2	180 (75.6)	58 (24.4)		216 (90.8)	22 (9.2)	

Values are expressed as *n* (%), unless stated otherwise. [a] X^2 test. [d] X^2 test for trend.

Table 6. Bivariate analyses using tinea cruris and pityriasis versicolor as dependent variables.

	Tinea Cruris			**Tinea Versicolor**		
Characteristic	**No**	**Yes**	***p* Value**	**No**	**Yes**	***p* Value**
Gender			<0.768 [a]			<0.114 [a]
Male	281 (85.4)	48 (14.6)		275 (83.6)	54 (16.4)	
Female	386 (84.6)	70 (15.4)		398 (87.3)	58 (12.7)	
Number of weekly trainings			0.008 [d]			0.038 [d]
Less than 4	288 (88.3)	38 (11.7)		286 (87.7)	40 (12.3)	
More than 4	313 (81.1)	73 (18.9)		317(82.1)	69 (17.9)	

Table 6. *Cont.*

	Tinea Cruris			Tinea Versicolor		
Characteristic	**No**	**Yes**	***p* Value**	**No**	**Yes**	***p* Value**
Average hours of daily training			0.301 [d]			0.204 [d]
Less than 1	9 (75.0)	3 (25.0)		9 (75.0)	3 (25.0)	
1–2	385 (83.3)	77 (16.7)		387 (83.8)	75 (16.2)	
More than 2	207 (87.0)	31 (13.0)		207 (87.0)	31 (13.0)	

Values are expressed as *n* (%), unless stated otherwise. [a] X^2 test. [d] X^2 test for trend.

Table 7. Bivariate analyses using friction burns and friction blisters as dependent variables.

	Tinea Manuum		
Characteristic	**No**	**Yes**	***p* Value**
Gender			<0.010 [a]
Male	272 (82.7)	57 (17.3)	
Female	406 (89)	50 (11.0)	
Number of weekly trainings			0.043 [d]
Less than 4	290 (89.0)	36 (11.0)	
More than 4	323 (83.7)	63 (16.3)	
Average hours of daily training			0.039 [d]
Less than 1	10 (83.3)	2 (16.7)	
1–2	387 (83.8)	75 (16.2)	
More than 2	216 (90.8)	22 (9.2)	

Values are expressed as *n* (%), unless stated otherwise. [a] X^2 test. [d] X^2 test for trend.

Athletes who exhibited tinea pedis had a significantly higher percentage of males ($p < 0.000$). The prevalence was 35.3% compared to 22.6%, with an odds ratio (OR) of 1.56, indicating that males are 1.56 times more likely than females to develop tinea pedis. Athletes who trained less than four times per week had a lower incidence of tinea pedis at 22.1% compared to 33.9% (OR = 1.53). The likelihood of developing tinea pedis is 1.53 times higher in those who train more than four times per week compared to those who train less than four times per week.

Athletes with tinea unguim were disproportionately female and had more than four weekly trainings than athletes without tinea unguim. The daily training hours for both fungal infections were 1–2 h.

Athletes who trained less than four times per week exhibited a lower incidence of groin tinea cruris at 11.7% compared to 18.9% (OR = 1.61). The likelihood of developing tinea cruris is 1.61 times higher in those who train more than four times per week compared to those who train less than four times.

A lower incidence of tinea versicolor was observed at 12.3% compared to 17.9% (OR = 1.45). Individuals who train more than four times per week are 1.45 times more likely to develop tinea versicolor compared to those who train less than four times per week. Athletes who trained for 1 to 2 h daily had a lower incidence of tinea versicolor at 13.9% compared to 24.1% (OR = 1.73). The likelihood of developing tinea versicolor is 1.73 times higher in athletes who did not consistently follow personal hygiene practices compared to those who always adhered to them.

Males exhibited a higher frequency of tinea manuum compared to females, with an incidence of 17.3% versus 11.0% (OR = 1.57). Males are 1.57 times more likely than females to develop tinea manuum. Athletes who trained less than four times per week had a lower

incidence of tinea manuum at 11.0% compared to 16.3% (OR = 1.48). The likelihood of developing tinea manuum is 1.48 times higher in those who train more than four times per week compared to those who train less frequently.

Athletes who trained for 1 to 2 h daily had a higher incidence of tinea manuum at 16.2%, compared to 9.2% for those training less than 1 h and 16.7% for those training more than 2 h (OR = 1.81). The likelihood of developing tinea manuum is 1.81 times higher for those training less than 1 h and 1.76 times higher for those training more than 2 h, compared to those training 1 to 2 h daily ($p < 0.05$).

4. Discussion

Fungal skin infections are classified into superficial and deep mycoses. Superficial skin mycoses are further categorized into dermatophytosis, candidiasis, and pityriasis. The most common mycosis among athletes is dermatophytosis. The responsible fungi can affect the stratum corneum of the epidermis, nails, hair, and mucous membranes [10]. Superficial fungal skin infections are common, affecting 20–25% of the general population. They are typically caused by dermatophytes and yeasts. Dermatophytosis is most frequently attributed to the *Trichophyton* species, with *T. tonsurans* and *T. rubrum* being the primary culprits [11].

4.1. Tinea Pedis

Tinea pedis (athlete's foot) is the most common dermatophytosis among athletes [12]. It encompasses fungal infections that can affect areas from the interdigital spaces to the entire plantar surface. This condition is more prevalent during the summer months. It is characterized by peeling, itching, and blisters, typically located in the interdigital spaces, the plantar arch, and the sides of the foot. It can also spread to the toenails and the hands (two feet, one hand disease). Toenail infections are seven times more common than fingernail infections [13,14]. The prevalence of the infection among athletes was 32%, compared to 20% in the control group. Athletes showed a 16% prevalence of onychomycosis and a 12% prevalence of foot mycosis [15]. In our study, the prevalence of tinea pedis among volleyball athletes was 27.9% (35.3% in men and 22.6% in women). The corresponding global prevalence of foot mycosis in the general population is 2.9% (4.2% in men and 1.7% in women). The significantly higher incidence of tinea pedis among volleyball athletes in our study compared to the general population is attributed to the prolonged use of closed footwear during training or matches, which creates a warm and moist environment, and to the absence of footwear in beach volleyball athletes, who move barefoot on the sand.

4.2. Tinea Unguium

Tinea unguim is a global issue, with its prevalence ranging between 2% and 13% of the adult population [16]. Tinea unguium is a nail infection caused by dermatophytes, yeasts, and occasionally by saprophytes. Beyond affecting the aesthetic appearance of the nails, it impacts patients' quality of life and physical activity, potentially causing pain or difficulty in walking. Factors that predispose individuals to onychomycosis include trauma, athletic activities, heat and moisture, diabetes mellitus, family history, and pre-existing dermatologic conditions. Tinea unguium must also be differentiated from nail psoriasis, which can similarly cause nail thickening, discoloration, and subungual hyperkeratosis. Additionally, lichen planus of the nails can mimic tinea unguium by presenting with longitudinal ridging, thinning, and dystrophy of the nails [17,18].

Tinea unguium accounts for approximately 40–50% of nail disorders. The warm and moist environment of the skin and the shared use of equipment predispose athletes to fungal infections. The likelihood of developing tinea unguis is increased due to the prolonged use of closed shoes, sweating, and the communal use of towels, changing rooms, and shared areas in swimming pools, where dermatophytes and yeasts, particularly Candida species, may be present [13]. In the present study, the prevalence of tinea unguis was 15.2% in males compared to 14.9% in females. The warm and moist environment of the

lower extremities, created by the prolonged use of closed footwear and shared equipment, predisposes athletes to fungal infections. The likelihood of developing tinea unguis in athletes is 2.5 times higher than in the general population. Other factors influencing athlete incidence include gender, hormonal influences, and smoking [13].

4.3. Tinea Cruris

Tinea cruris refers to dermatophytic infections affecting the groin and buttock areas. It presents as an erythematous, scaly plaque with peripheral expansion, often accompanied by itching, initially occurring unilaterally and subsequently bilaterally. Predisposing factors include moisture from sweating, sharing clothing, and close contact between athletes [19]. Itching is more commonly observed in young male athletes. In athletes, the development of tinea cruris is facilitated by the warm and moist environment created by athletic apparel and uniforms that cover the groin area. Direct contact with teammates who have a similar infection, especially if it is not covered by clothing or inadequately treated, can lead to disease transmission [20].

Differential diagnoses of tinea cruris include several other dermatological conditions that may present with similar features. When diagnosing fungal infections such as tinea cruris or tinea unguium, it is essential to consider these alternatives. Tinea cruris should be distinguished from inverse psoriasis (psoriasis of the folds), which typically presents with erythematous plaques in body folds but often lacks the fine scaling characteristic of fungal infections. Accurate differentiation between these conditions is critical, as the treatment approaches differ significantly. Broadening the clinical considerations in this manner improves diagnostic accuracy and promotes more effective treatment strategies [17,18].

In a study by Manuel et al. on fungal infections, the occurrence of tinea cruris was observed in beach volleyball athletes [21]. This is one of the few studies specifically referencing volleyball athletes in general. In our study, the prevalence of tinea cruris was recorded at 15% (15.4% in women and 14.6% in men). The global prevalence of the disease ranges from 20% to 25%. Adolescents and adult men, primarily in developing and tropical countries, constitute the majority of patients with tinea cruris [22]. The higher prevalence of tinea cruris in women observed in our study is inconsistent with the literature and is likely attributed to the greater number of female (456) compared to male (329) volleyball athletes.

4.4. Tinea Versicolor

Tinea versicolor is a common, chronic, mild, and recurrent infection of the stratum corneum of the skin, typically asymptomatic, caused by lipophilic yeasts of the genus Malassezia, which are part of the normal skin flora [4]. The condition is more frequently observed in tropical and temperate climates and exhibits equal prevalence across genders and ethnicities. Clinically, it is characterized by the appearance of multiple pale white, pink, or tawny patches with fine, powdery scaling [23]. In children, the infection is typically found on the face, whereas in adults it is commonly located on the upper trunk, abdomen, neck, and arms. Moisture, oily skin, and excessive heat promote the growth of this organism. The potential presence of the disease in athletes does not necessitate removal from their training. In a study of 559 high school athletes from various sports, the yeast *Malassezia* spp. (*M. furfur*) was detected in 43.3% of athletes compared to 23.4% of non-athletes [24]. In the present study, tinea versicolor was observed in athletes with a prevalence of 14.3% (12.7% in female and 16.4% in male), primarily affecting the corpus (73.5%), which agree with other studies reporting that the most commonly affected areas are the corpus, neck, and proximal extremities [25–27]. The disease affects 1% of the global population, with prevalence reaching up to 40% in some tropical countries and as low as 1.1% in colder climates. It is more commonly seen in adolescents and young adults due to increased sebum production and affects both genders equally [28].

When diagnosing fungal skin infections, particularly tinea versicolor, it is important to consider other dermatological conditions that may present with similar clinical features. Tinea versicolor must be differentiated from pityriasis rosea, which typically presents with

a herald patch and a characteristic "Christmas tree" distribution on the trunk. Additionally, pityriasis rosea-like eruptions, which may result from viral infections or drug reactions, can also resemble tinea versicolor. Psoriasis, particularly guttate psoriasis, can sometimes mimic fungal infections, as it presents with scaly plaques. Moreover, secondary syphilis should be included in the differential diagnosis, given its diverse cutaneous manifestations, which may overlap with those of fungal infections. Accurate diagnosis is essential to ensure that appropriate treatment is administered, and this highlights the importance of considering a wide range of possible conditions when assessing skin lesions [29,30].

4.5. Tinea Manuum

Tinea manuum describes dermatophytic infections affecting the palmar surfaces of the hands. It is typically unilateral but can affect both hands [31]. When lesions are present on the palms, they manifest as blisters or scaling rashes in the folds, accompanied by thickening of the skin, creating an appearance reminiscent of a powdered hand. In our study, the prevalence of hand mycosis was 13.6% (17.3% in males and 11% in females). The corresponding prevalence in the general population is 2.8% (4% in males and 1.7% in females). Our results align with other studies indicating that tinea pedis is more prevalent than tinea manuum, with rates of 27.9% and 13.6%, respectively [32].

5. Conclusions

Beach volleyball athletes are at a significantly increased risk of developing fungal infections due to the sport's distinct environmental conditions, such as frequent contact with sand, high humidity, and prolonged exposure to heat. Effective prevention strategies, including consistent hygiene practices, the use of breathable, moisture-wicking clothing, and regular skin examinations, are critical for reducing infection rates. Educational programs for athletes and coaches regarding these risks and prevention methods should be implemented as part of routine care. Moreover, further research is warranted to investigate more specific prevention and management strategies, and to identify detailed risk factors linked to different playing environments, particularly in regions with climates that exacerbate fungal proliferation, such as the Mediterranean. This research will help develop targeted interventions to better protect athletes from these infections.

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References

1. Havlickova, H.; Czaika, A.V.; Friedrich, M. Epidemiological trends in skin mycoses worldwide. *J. Mycoses* **2008**, *4*, 2–5. [CrossRef]
2. Tosti, A.; Piraccini, B.M. Dermatophyte infections. In *European Handbook of Dermatological Treatments*; Springer: Berlin/Heidelberg, Germany, 2003; pp. 131–134, ISBN 9783642056574. [CrossRef]
3. Neabore, K.L. Wake-up Call: Rapid Increase in Human Fungal Diseases under Climate Change. *Environ. Health Perspect.* **2024**, *132*, 420001. [CrossRef]

4. Winokur, C.R.; Dexter, W.W. Fungal infections and parasitic infestations in sports: Expedient identification and treatment. *Phys. Sportsmed.* **2004**, *32*, 23–33. [CrossRef]
5. Deligios, M.; Mazzarello, V.; Fiamma, M.; Barac, A.; Diana, L.; Ferrari, M.; Murgia, M.; Paglietti, B.; Rubino, S. Seasonal Variation in Fungi in Beach Sand in Summertime: Stintino (Italy). *Int. J. Environ. Res. Public Health* **2023**, *20*, 7134. [CrossRef]
6. Vogel, C.; Rogerson, A.; Schatz, S.; Laubach, H.; Tallman, A.; Fell, J. Prevalence of yeasts in beach sand at three bathing beaches in South Florida. *Water Res.* **2007**, *41*, 1915–1920. [CrossRef]
7. Adamczyk, K.; Garncarczyk, A.; Antończak, P.; Wcisło-Dziadecka, D. The foot microbiome. *J. Cosmet. Dermatol.* **2020**, *19*, 1039–1043. [CrossRef]
8. Brandão, J.; Gangneux, J.P.; Arikan-Akdagli, S.; Barac, A.; Bostanaru, A.; Brito, S.; Bull, M.; Çerikçioğlu, N.; Chapman, B.; Efstratiou, M.; et al. Mycosands: Fungal diversity and abundance in beach sand and recreational waters—Relevance to human health. *Sci. Total Environ.* **2021**, *781*, 146598. [CrossRef]
9. Rallis, E.; Tertipi, N.; Sfyri, E.; Kefala, V. Prevalence of Skin Injuries in Beach Volleyball Athletes in Greece. *J. Clin. Med.* **2024**, *13*, 2115. [CrossRef]
10. Pleacher, D.M.; Dexter, W.W. Cutaneous Fungal and Viral Infections in Athletes. *Clin. Sports Med.* **2007**, *26*, 397–411. [CrossRef] [PubMed]
11. Khodadadi, H.; Zomorodian, K.; Nouraei, H.; Zareshahrabadi, Z. Prevalence of superficial-cutaneous fungal infections in Shiraz, Iran: A five-year retrospective study (2015–2019). *J. Clin. Lab. Anal.* **2021**, *35*, 23850. [CrossRef] [PubMed]
12. Nigam, K.P.; Saleh, D. *Tinea Pedis*; Stat Pearls: Treasure Island, FL, USA, 2022; [Internet] Last Update: 3 July 2022; Bookshelf ID: NBK470421. [PubMed]
13. Daggett, C.; Brodell, R.; Daniel, R.; Jackson, J. Onychomycosis in Athletes. *Am. J. Clin. Dermatol.* **2019**, *20*, 691–698. [CrossRef]
14. Kang, R.; Lipner, S. Consumer preferences of antifungal products for treatment and prevention of tinea pedis. *J. Dermatolog. Treat.* **2019**, *30*, 745–749. [CrossRef]
15. Sabarin, S.C.; Benveqnu, A.S.; Fortura, M.M.; Saggin, L.M.; Tomimori, J.; Fischman, O. Onychomycosis and tinea pedis in athletes from the State of Rio Grande Do Sul (Brazil): A cross-sectional study. *Mycopathologia* **2011**, *171*, 183–189. [CrossRef]
16. Kamihama, T.; Kimura, T.; Hosokawa, J.I.; Ueji, M.; Takase, T.; Tagami, K. Tinea pedis outbreak in swimming pools in Japan. *Public Health* **1997**, *111*, 249–253. [CrossRef]
17. Wahlen, B.M.; El-Menyar, A.; Elkholy, A. Differential Diagnosis of Retronychia, Onychomycosis and Onychomadesis. *Eur. J. Case Rep. Intern. Med.* **2024**, *11*, 004326. [CrossRef] [PubMed] [PubMed Central]
18. Bertanha, L.; Michalany, A.O.; Damas, I.I.; Di Chiacchio, N.; Cintra, M.L. Tangential biopsy of the nail bed and matrix, with plate evaluation, for diagnosis of lichen planus. *J. Eur. Acad. Dermatol. Venereol.* 2024; *epub ahead of print*. [CrossRef] [PubMed]
19. Zinder, S.M.; Basler, R.; Foley, J.; Scarlata, C.; Vasily, D.B. National athletic trainers' Association Position Statement: Skin Diseases. *J. Athl. Train.* **2010**, *45*, 411–428. [CrossRef]
20. Ely, J.W.; Rosenfeld, S.; Stone, S.M. Diagnosis and management of tinea infections. *Am. Fam. Physician* **2014**, *90*, 702–710.
21. Manuel, J.; Olmedo, J.; Penichet, A. Injuries and pathologies in beach volleyball players: A systematic review. *J. Hum. Sport Exerc.* **2015**, *10*, 936–948. [CrossRef]
22. Pippin, M.; Madden, M.; Das, M. *Tinea Cruris*; Stat Pearls: Treasure Island, FL, USA, 2022; [Internet], Bookshelf ID: NBK554602. [PubMed]
23. Rigopoulos, D.; Stratigos, A.; Katoulis, A.; Grigoriou, S.; Rallis, E. *Handbook of Dermatology and Venereology*; Neon Medical Publications; AITBS Publishers: Delhi, India, 2021; ISBN 978-618-5515-00-3.
24. Liebich, C.; Wergin, V.V.; Schubert, I.; Bruehl, M.L.; Marquart, C.; Halle, M.; Oberhoffer, R.; Wolfarth, B. Dermatoses in Competitive Athletes. *Ger. J. Sports Med.* **2021**, *72*, 5–12. [CrossRef]
25. Karray, M.; McKinney, W. *Tinea Versicolor*; Stat Pearls: Treasure Island, FL, USA, 2021; [Internet], Bookshelf ID: NBK482500. [PubMed]
26. Brandi, N.; Starace, M.; Alessandrini, A.; Piraccini, B.M. Tinea versicolor of the neck as side effect of topical steroids for alopecia areata. *J. Dermatolog. Treat.* **2019**, *30*, 757–759. [CrossRef] [PubMed]
27. Choi, F.D.; Juhasz, M.L.W.; Mesinkovska, N. Topical ketoconazole: A systematic review of current dermatological applications and future developments. *J. Dermatolog. Treat.* **2019**, *30*, 760–771. [CrossRef]
28. Diongue, K.; Kébé, O.; Faye, M.D.; Samb, D.; Diallo, M.A.; Ndiaye, M.; Seck, M.C.; Badiane, A.S.; Ranque, S.; Ndiaye, D. MALDI-TOF MS identification of Malassezia species isolated from patients with pityriasis versicolor at the seafarers' medical service in Dakar, Senegal. *J. Mycol. Med.* **2018**, *28*, 590–593. [CrossRef]
29. Drago, F.; Broccolo, F.; Ciccarese, G. Pityriasis rosea, pityriasis rosea-like eruptions, and herpes zoster in the setting of COVID-19 and COVID-19 vaccination. *Clin. Dermatol.* **2022**, *40*, 586–590. [CrossRef] [PubMed] [PubMed Central]
30. Zhang, J.; Li, X.; Shi, D. A case of secondary syphilis misdiagnosed as psoriasis vulgaris: Discover the real cause beyond the surface with reflection confocal microscopy and leave the great imitator nowhere to hide. *Skin Res. Technol.* **2023**, *29*, e13374. [CrossRef] [PubMed] [PubMed Central]

31. Chamorro, M.J.; Syed, H.A.; House, S.A. *Tinea Manuum*; Stat Pearls Publishing: Treasure Island, FL, USA, 2024; [Internet]; Bookshelf ID: NBK559048. [PubMed]
32. Perea, S.; Ramos, M.; Garau, M. Prevalence and risk factors of tinea unguium and tinea pedis in the general population in Spain. *J. Clin. Microbiol.* **2000**, *38*, 3226–3230. [CrossRef]