

Tropical Skin Infections Among Israeli Travelers

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Abstract. Infectious skin disorders are common dermatologic illnesses in travelers. Knowledge of post-travel-related infectious skin disorders will allow for effective pre- and post-travel counseling. All cases of returning travelers seen in our center seeking care for infectious skin diseases were included in this study. For a comparison, data on returned travelers with non-infectious skin diseases and healthy travelers who had pre-travel consultations in our institution were also analyzed. Altogether, skin-related diagnosis was reported in 540 ill travelers, and among them, 286 (53%) had infectious skin diseases. Tropical skin infection was diagnosed in 64% of the infectious cases. Travelers returning from Latin America were significantly more ill with tropical skin infections than those traveling to Asia and Africa. The most common diagnoses were cutaneous leishmaniasis, myiasis, and cutaneous larva migrans. In conclusion, tropical skin infections are common among Israeli travelers, especially among those who visited Latin America.

INTRODUCTION

Skin disorders are among the most common reasons that returned travelers seek medical care, accounting for 18% of visits.^{1–4} Potentially, 10% of cases may be serious enough to lead to hospitalization.⁵ Skin infections are an important cause of cutaneous problems in travelers during and after return, including non-tropical (cosmopolitan) skin infections caused by bacterial, fungal, and ecto-parasites and tropical skin infections such as cutaneous leishmaniasis, myiasis, and cutaneous larva migrans.^{5–8} Knowledge of the relative frequency of travel-related skin infections together with their geographic and demographic risk factors may allow for effective pre-travel counseling as well as improved post-travel diagnosis and care.

It is believed that skin infections among local populations differ significantly from those of travelers; thus, one cannot assume that the epidemiology of disorders of the local population applies to the travel population.

The aim of this study was to focus on the epidemiology and clinical spectrum of skin infections, including tropical and non-tropical infections in returning travelers.

In addition, by comparing data collected on patients seen in our pre-travel clinic with the data on the ill travelers with infectious dermatologic disease, we were able to get a better perspective on population and destination at higher risk.

METHODS

This study was conducted on travelers presenting at the Center for Geographic Medicine and Dermatology Department at Sheba Medical Center, Tel Hashomer, Israel, from July 1998 to February 2008. All data were entered into a computerized detailed database, and they are part of the GeoSentinel database.³ Only travelers were included in this study (i.e., immigrants and foreign workers were excluded). Patients' data were collected, including demographics, travel history, reason for patient visit, most likely place of exposure, and setting of patient interaction (e.g., inpatient versus outpa-

tient). Infectious diseases were diagnosed by pathogen detection (e.g., myiasis, tungiasis, dermatophytosis, and scabies), by diagnosis of *Leishmania* by smear or biopsy showing amastigotes within the dermal infiltrate, and/or by polymerase chain reaction (PCR), which also gave species-specific diagnosis. If no specific pathogen was identified, the diagnosis was based on epidemiologic and clinical grounds (e.g., infectious cellulitis and cutaneous larva migrans) or response to a specific treatment (e.g., scabies). Systemic febrile diseases with exanthema were not included in this cohort (e.g., dengue fever and rickettsiosis). Data on a random sample of healthy travelers who encountered pre-travel consultation during 1999–2006 were also collected (8,280 of 36,253; 22.8%). This method was used before in a similar article.⁹ The study was approved by the ethical committee of the hospital.

We compared the demographics and travel information of the returning travelers with infectious dermatoses, ill travelers with non-infectious dermatologic diseases, and healthy travelers presenting at our pre-travel clinic. The relative frequency of dermatologic infectious diagnoses and their association with patient demographic and travel characteristics were analyzed. Univariate analysis of categorical variables was performed using the χ^2 or Fisher's exact test. The 95% confidence intervals (CIs) of the odds ratios were estimated using the Fisher's exact method. All tests were performed using SPSS (SPSS Inc., Chicago, IL) version 14. Statistical significance was defined as two-tailed $P < 0.05$.

RESULTS

During this 10-year study, 2,834 post-travel patients were seen, of which 540 (19%; 95% CI = 17–20%) suffered from skin disorders. Among them, 286 (53%) suffered from infectious dermatologic disease, and 254 (47%) suffered from non-infectious dermatologic disease (Table 1). In the group with the infectious dermatologic disease, 194 were males, and 92 were females (67.8% and 32.2%, respectively). The mean age (\pm SD) was 29 (\pm 11) years (range = 11–77 years); the median travel time was 93 days (range = 1–2,095 days, 25th percentile = 31 days, 75th percentile = 186 days). Most patients were treated in an outpatient setting, whereas 14% were hospitalized.

A comparison of the characteristics of the ill returning travelers with infectious dermatoses, ill travelers with non-infectious

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TABLE 1

Basic characteristics of returned travelers with infectious or non-infectious dermatologic diseases and travelers with no dermatologic disease (healthy travelers)

	Ill travelers with infectious dermatologic diseases	Ill travelers with non-infectious dermatologic diseases	Healthy travelers	P value*†
	N (%)	N (%)	N (%)	
Total	286 (53)	254 (47)	36,253	
Age (years)				
≤ 20	8 (2.8)	13 (5.2)	1,957 (5.4)	< 0.001*†
21–40	240 (85.4)	169 (67.9)	26,428 (72.9)	
41–60	25 (8.9)	50 (20.1)	6,272 (17.3)	
> 60	8 (2.8)	17 (6.8)	1,559 (4.3)	
Female gender (%)	92 (32.2)	138 (54.3)	16,676 (46.0)	< 0.001*†
Time from return to clinic visit				
< 8 days	89 (31.1)	100 (39.4)	–	< 0.001*
8–35 days	87 (30.4)	60 (23.6)	–	
> 35 days	87 (30.4)	50 (19.7)	–	
Unknown	23 (8.0)	44 (17.3)	–	
Purpose of travel				
Tourism	267 (93.4)	228 (89.8)	31,903 (88.0)	0.088*
Business	18 (6.3)	20 (7.9)	2,175 (6.0)	< 0.001†
Missionary/volunteer/research	1 (0.3)	6 (2.4)	2,175 (6.0)	
Travel duration				
< 2 weeks	14 (4.9)	37 (14.6)	7,505 (20.7)	< 0.001*†
2–8 weeks	81 (28.3)	97 (38.2)	15,045 (41.5)	
> 8 weeks	167 (58.4)	70 (27.6)	12,507 (34.5)	
Unknown	24 (8.4)	50 (19.7)	1,196 (3.3)	
Mean ± SD	148 ± 206	74 ± 104	–	

* Comparison between ill travelers with infectious dermatologic and non-infectious dermatologic diseases.

† Comparison between ill travelers with infectious dermatologic diseases and healthy travelers.

dermatologic diseases, and healthy travelers presenting at our pre-travel clinic is presented in Table 1. Geographic locations of ill travelers with infectious and non-infectious dermatologic diseases and healthy travelers are presented in Table 2. The most common travel destination of the healthy travelers was Asia (55%), and indeed, ill travelers with non-infectious dermatologic diseases were travelers to Asia (46.9%). However, Latin America was overrepresented among the ill returning travelers with infectious dermatologic diseases, accounting for 59.1% compared with 20.0% among the healthy travelers and 33.1% with non-infectious dermatologic diseases ($P < 0.001$).

TABLE 2

Geographic destinations of ill travelers with infectious and non-infectious dermatologic diseases and healthy travelers

Region of travel*	Ill travelers with infectious dermatologic diseases	Ill travelers with non-infectious dermatologic diseases	Healthy travelers
	N (%)	N (%)	N (%)
Total	286	254	36,253
America	169 (59.1)	84 (33.1)	7,251 (20.0)
South America	142 (49.7)	64 (25.2)	
Central America	23 (8.0)	18 (7.1)	
Caribbean	3 (1)	1 (0.4)	
North America	1 (0.3)	1 (0.4)	
Asia	81 (28.3)	119 (46.9)	19,939 (55.0)
Southeast Asia	41 (14.3)	53 (20.9)	
Southcentral Asia	37 (12.9)	52 (20.5)	
Northeast Asia	0 (0)	7 (2.8)	
Middle East	3 (1.0)	7 (2.8)	
Africa	31 (10.8)	34 (13.4)	8,701 (24.0)
Sub-Saharan Africa	30 (10.5)	34 (13.4)	
North Africa	1 (0.3)	0 (0)	
Other	5 (1.7)†	17 (6.7)‡	362 (1.0)

* According to World Health Organization criteria.

† Oceania, 4; unknown, 1.

‡ Oceania, 5; Eastern Europe, 5; Western Europe, 5; unknown, 2.

Trip duration was also found to have considerable impact on outcome (Table 1). A trip of more than 8-weeks duration was more common among travelers returned with an infectious dermatologic disease compared with healthy travelers (58.4% versus 34.5%; odds ratio [OR] = 3.69; 95% CI = 2.53–5.39; $P < 0.0001$), whereas a short trip (< 2 weeks) was less common among travelers with infectious dermatologic diseases compared with healthy travelers (4.9% versus 14.6%; OR = 0.30; 95% CI = 0.15–0.59; $P < 0.0001$).

Thirty-one percent (95% CI = 26–37%) of the ill returning travelers with infectious dermatologic diseases in our study sought healthcare within 1 week of their return. However, 30.4% (95% CI = 25–36%) of the ill patients came to the clinic more than 1 month after returning home (Table 1). Among the patients who arrived after 1 month, most were those with chronic skin infections such as leishmaniasis (40/92; 43.5%) or recurrent bacterial skin infections (26/92; 28.3%).

The three most common diagnoses were bacterial skin infections, leishmaniasis, and myiasis (31.8%, 28.7%, and 19.2%, respectively), but altogether, tropical skin infections (e.g., leishmaniasis, myiasis, and cutaneous larva migrans [CLM]) were the leading cause of seeking medical care, accounting for 64% (95% CI = 57–69%) of all cases (Table 3).

Among the tropical group, leishmaniasis was the leading pathogen (45.3%) (Table 3).

There were gender differences among the various diseases. Leishmaniasis, CLM, and bacterial skin infections were seen predominantly in male travelers (79.3%, 68.2%, and 68.1%, respectively); myiasis was equally presented in males and females (Table 3).

Although the majority of patients returning from Latin America had tropical skin infection (e.g., leishmaniasis and myiasis), ill travelers returning from Asia and Africa suffered mainly from bacterial skin infections.

TABLE 3
Infectious dermatologic diseases diagnosed in 286 Israeli travelers

Infectious disease	Leishmaniasis* (N = 82)	Myiasis (N = 55)	CLM (N = 44)	Bacterial skin infection (N = 91)	Other† (N = 12)
	N (%)	N (%)	N (%)	N (%)	N (%)
Female gender	17/82 (20.7)	27/55 (49.1)	14/44 (31.8)	29/91 (31.9)	5/12 (41.7)
Travel duration mean days ± SD	211 ± 117	97 ± 75	86 ± 101	159 ± 321	200 ± 186
Region‡					
Latin America (N = 169)	75 (44.4)	46 (27.2)	22 (13)	16 (9.5)	10 (5.9)
Asia (N = 81)	3 (3.7)	0 (0)	19 (23.5)	58 (71.6)	1 (1.2)
Africa (N = 31)	3 (9.7)	9 (29.0)	3 (9.7)	13 (41.9)	3 (9.7)
Specific countries‡§					
Bolivia (N = 96)	65 (67.7)	28 (29.2)	2 (2.1)	1 (1)	None
Thailand (N = 36)	None	None	17 (47.2)	19 (52.8)	None
India (N = 30)	None	None	None	29 (96.7)	1 (3.3)
Brazil (N = 22)	2 (9.1)	4 (18.2)	11 (50)	2 (9.1)	3 (13.6)

* Cutaneous leishmaniasis, 77; mucocutaneous leishmaniasis, 5.
 † Fungal infection, 6; scabies, 5; Lyme disease, 1.
 ‡ The percent of every infection within a specific region or country is shown.
 § Data for the top four endemic countries.

Countries where one disease accounted for more than one-half of all infectious dermatologic diagnoses are listed in Table 3. CLM was the leading diagnosis in Brazil (50.0%), leishmaniasis was the leading diagnosis in Bolivia (67.7%), and bacterial skin infection was the leading diagnosis in India (96.7%) and Thailand (52.8%). Bolivia, Thailand, India, and Brazil accounted for 64% of all skin infection cases. The three most common diagnoses in each continent are shown in Figure 1 .

DISCUSSION

The current study represents a large observational study on returning travelers exclusively (immigrants were excluded) from tropical destinations presenting with infectious dermatologic conditions. This study is unique in comparing basic char-

acteristics of three groups of patients: returning travelers with infectious dermatologic disease, returning travelers with non-infectious dermatologic diseases, and healthy travelers presenting before travel at our pre-travel clinic.

Dermatologic conditions are common among returning travelers and accounted for 19% of all visits of ill returning travelers at the Center for Geographic Medicine clinic in Israel. This is consistent with previous reports from the GeoSentinel Network.³ Comparing the data of the population of healthy Israeli travelers with those of ill returning travelers with infectious dermatologic disease and ill returning travelers with non-infectious dermatologic diseases, we noticed that travelers returning from Latin America have a significantly higher chance of getting infectious skin disorders compared with those returning from other destinations. Although the proportion of healthy travelers going to Latin America

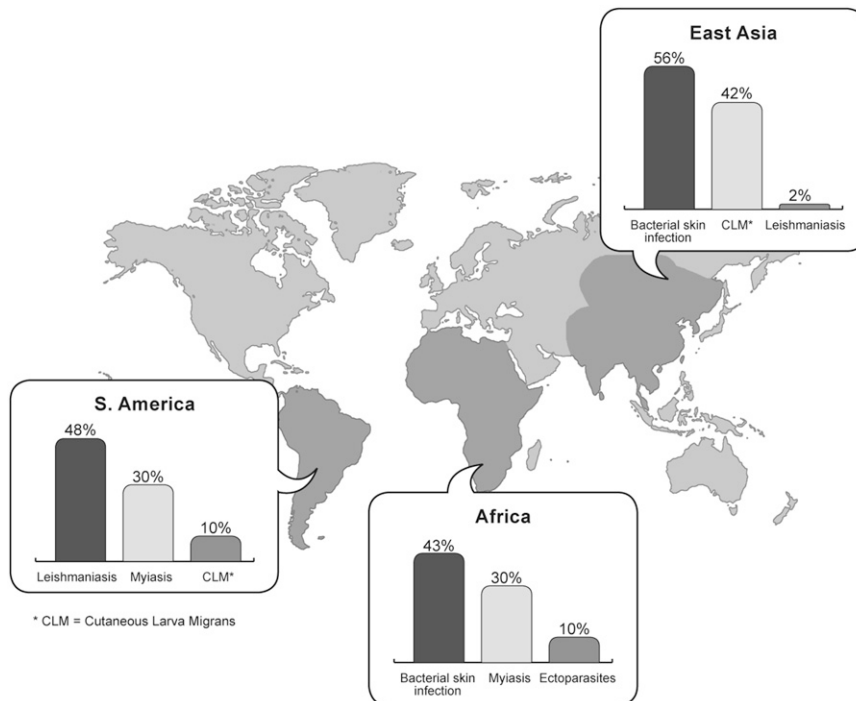


FIGURE 1. Diseases and destinations: the three most common skin infections in each continent visited.

encompasses only 20% of the healthy travelers, returning travelers with infectious dermatologic disease from the Americas account for 59.1% (Table 2). This implies that infectious skin diseases are more common in the Americas. A similar conclusion can be drawn from the GeoSentinel study on dermatological conditions in travelers using a different method of comparison. Among travelers who presented to GeoSentinel sites, dermatologic problems occurred disproportionately higher among those returning from Latin America (the Caribbean or Central or South America), compared with those returning from other destinations.⁶

Infectious skin conditions in travelers can be divided into classical tropical types (for example, CLM, leishmaniasis, and myiasis) and non-tropical cosmopolitan types (for example, pyoderma and cellulitis).⁴ The most common group in our report was that of tropical diseases (63.5%), and among them, leishmaniasis was the leading pathogen.

The high rate of tropical skin infections in our cohort is mainly because of the high rate of cutaneous leishmaniasis, which accounts for 45.3% of this group (Table 3). This high rate is about five times higher compared with reports of travelers from other Western countries.^{3,5,7} Another unique aspect in our leishmaniasis cases is that almost all of our cases were related to *Leishmania braziliensis* (91.4%), which was acquired in the Madidi National Park in the Amazon basin in Bolivia. Our explanation for this phenomenon is the fact that a popular, almost cult, Israeli book entitled *Back from Tuichi* popularized this destination among young Israeli travelers. Indeed, Scope and others¹⁰ estimated the incidence of leishmania infection among Israeli travelers to Bolivia to be at least 1 to 360.

Other features associated with leishmaniasis in our travelers included male predominance (79.3%) and long travel duration (211 ± 117 days). These features concur with previous reports in travelers.^{3,10-12}

Myiasis was the second most common tropical skin infection that was predominantly acquired in the Americas (83.6% of cases). Most of the patients who presented with myiasis from the Americas had also returned from Madidi National Park in Bolivia, with an estimated attack rate of 1 per 190 travelers.¹³ In these cases, the myiasis was caused by *Dermatobia hominis*. The rest of the cases were acquired in Africa by Tumbu flies (*Cordylobia anthropophaga*). Interestingly, in myiasis, there is no gender preference (Table 3), unlike the male predominance clearly seen with leishmaniasis, although both vector-borne diseases acquired in most cases were in the same geographic areas.

CLM is reported to be the most common infectious skin problem of tropical origin in travelers, with rates ranging between 5% and 25% among returned travelers with dermatoses.^{3,5-7} It is most commonly seen in returning travelers from the Caribbean region.³ In our study, CLM accounts for 15.4% of all the cases and was acquired mainly in Thailand and Brazil, with a male predominance of 68.2%.

The most common non-tropical infectious dermatoses were bacterial skin infections (31.9%) (Table 3). Similar rates of bacterial skin infections were reported by Ansart and others⁷ (21%) and the GeoSentinel Network study (13%).^{3,14} Surprisingly, in our series, the Andaman Islands in India were the most endemic place for this phenomenon (data not shown).

Males made up 67.8% of the ill returning travelers with infectious dermatologic disease and 54% of the healthy travel

population ($P < 0.001$). It may be postulated that tropical skin infections are more common in men because of more risk-taking behaviors and travel to more remote destinations where the chance of acquiring tropical diseases is higher. Additionally, men may be less likely to adhere to preventive measures and therefore, are at an increased risk of contracting disease. Another explanation for gender predominance could be sex differences regarding the vectors attraction to different hosts.

The prevalence of tropical exotic skin diseases is diverse in the different series published.^{3,5,7} Although Caumes and others⁵ reported that 53% of their patients had a classical tropical disease (e.g., CLM, myiasis, leishmaniasis, or dengue), in the GeoSentinel Network, only 24% were reported. In our study, 65% of the patients were classified as having tropical skin diseases even without including the febrile diseases with exanthema (e.g., dengue fever and rickettsiosis). The differences between the various reports might be because of inclusion criteria of the diseases that are included and the character of the traveler population studied.

Several limitations of our study are noteworthy. First, many infectious dermatological conditions are self-limited and may resolve before a clinic visit or confirmation of the etiology was possible. Second, only patients who were seen in our center were included. Data would not be captured if the traveler was treated successfully abroad or by his primary care physician. Third, our study, as well as other case series, is not capable of providing a true incidence of the various infectious dermatoses in travelers, because neither numerator nor denominator is clearly known. Finally, because traveling populations may be diverse, we must be cautious when extrapolating the findings of a study in one discrete population to others. Nonetheless, this case series is an extremely valuable way to examine the dermatological infectious diseases and travel characteristics of those who do present to a healthcare professional after travel.

In summary, dermatologic conditions are common in travelers and were found in 19.7% of ill returning travelers seen at our center in Israel. Tropical skin infections were more common than non-tropical infections. Travelers who visited Latin America and especially, the tropical areas in Bolivia experienced the highest infectious morbidity because of dermatologic conditions, especially cutaneous leishmaniasis and myiasis. Many dermatologic infectious conditions related to travel could be prevented by consistently applying arthropod repellent, wearing closed shoes, and maintaining good skin hygiene.

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