

DERMATOLOGICAL CONDITIONS OF TRAVELERS RETURNING TO THAILAND FROM TRAVEL ABROAD: A PROSPECTIVE STUDY

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Abstract. Dermatological problems are among the most common travel health risks. A prospective observational study was conducted among Thai travelers attending the Travel Clinic, Hospital for Tropical Diseases, Mahidol University, Thailand during February 2018 to January 2019 and who intended to remain abroad for less than two months to determine spectrum, risk factors and impact of skin problems encountered during their travel. Pre-travel information and previous knowledge of travel-related skin problems were obtained based on a questionnaire, and another questionnaire was conducted on Days 7 and 14 post-return via either telephone or Line application. Those experiencing dermatological problems were evaluated on the impact of their conditions using a Thai version of dermatology life quality index (DLQI). Mean age of participants ($n = 270$) was 39 years old, most common destination was Asia (37%) with median duration of stay abroad of 11 days (range of 2-54 days). Although the majority participants had a good level of knowledge regarding potential travel-related skin problems, 24% of participants developed skin problems during their trip, most common being dry skin (10%), arthropod bite (3%), sunburn (2%) and eczema (2%), 50% of whom reported impaired (from small to moderate/severe) quality of life according to DLQI assessment. Multivariate analysis shows outdoor activity without protection against sun exposure and stay >14 days in Europe/North America/Australia/New Zealand were independent factors associated with skin problems. In order to raise awareness of potential dermatological problems while traveling abroad and encourage appropriate cautionary behavior, pre-travel counseling on risks and preventive measures is recommended for all Thai international travelers.

Keywords: dermatological problem, international traveler, risk behavior, preventive measure, Thai traveler

INTRODUCTION

The number of international travelers is rising annually, including Thais traveling abroad (World Tourism Organization, 2018). The number of health problems in travelers has also increased (Korzeniewski *et al*, 2015), with

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dermatological conditions being one of the most common health problems among international travelers (Hill, 2000; Freedman *et al*, 2006; Lederman *et al*, 2008), comprising mainly skin infections and changes due arthropod bites and stings, photodermatoses and physical and chemical damage (Hochedez and Caumes, 2008). Adverse dermatological conditions among travelers are often overlooked or neglected by travelers themselves, although these conditions should not be overlooked due to their possible impact on normal daily life (Korzeniewski *et al*, 2015).

In Thailand, there has been no previous study of dermatological conditions among Thai travelers. A prospective cohort follow-up study was initiated in Thai travelers recruited at a pre-travel visit in a travel clinic in Thailand to determine spectrum and impact of dermatological conditions following their return from international travel. In addition, knowledge, attitudes and practice regarding travel-related dermatological conditions in this group were gathered. Information from the study will provide baseline data regarding spectrum of skin problems among returning Thai travelers and provide practitioners in travel medicine information for developing programs for pre-travel preventive measures, recommendations for a travel first-aid medical kit. Furthermore, the study may also help with post-travel consultations, when it is essential to post-travel recognition of skin conditions requiring prompt medical prompt treatment.

MATERIALS AND METHODS

Recruitment of participants

Participants were recruited from

Thai travelers visiting the Travel Clinic, Hospital for Tropical Diseases, Faculty of Tropical Medicine, Mahidol University, Bangkok Thailand during February 2018 to February 2019. Inclusion criteria were travelers going abroad, ≥ 18 years of age and willingness to complete a pre-travel questionnaire and to provide health information on Days 7 and 14 post-return.

Based on a previous study of Thai travelers ($n = 817$), in which 16.2% of travelers developed dermatological symptoms after trips abroad (Matsee, 2017), a 20% prevalence is used to calculate a sample size of 283 participants using an OpenEpi software version 3 (<http://www.openepi.com/>) with an estimated loss to follow-up of 15%. The research protocol was approved by the Ethics Committee, Faculty of Tropical Medicine, Mahidol University (approval no. TMEC 17-080). Every participant provided prior written informed consent.

Study design

Prior to departure, participants were invited to the Travel Clinic, Hospital for Tropical Diseases, Faculty of Tropical Medicine, Mahidol University to complete a 3-page questionnaire on their demographic data, travel destination(s), style of travel and activities, dates of departure and return, knowledge and attitudes regarding travel-related skin problems, and contact e-mail and phone number for appointments of the two follow-up visits. In addition, each participant was provided a form to record any dermatological problems encountered and to photograph any skin changes occurring during travel.

On Days 7 and 14 post-return, participants were contacted by telephone or LINE application for information on any symptoms of skin problems encountered

during or after travel, any measures taken regarding travel-related skin problems and exposure to possible risk factors of travel-related skin diseases. If participants had any symptoms of skin problems, they were requested to visit the Hospital for Tropical Diseases for examination by physicians. Final diagnosis was made by dermatologists. If unable to come to the Hospital, participants were requested to send picture(s) of their skin lesion(s) via e-mail or LINE application to the Hospital contact unit. Participants with dermatological conditions were given a Dermatology Life Quality Index (DLQI; Thai version) evaluation by telephone or LINE application to determine impact of their conditions. Individuals are considered lost to follow-up after three unsuccessful contact attempts.

DLQI (Thai version) consists of a questionnaire to evaluate six domains of quality of life, namely, symptoms and feelings, daily activities, leisure, work and school, personal relationships, and treatment. There are 10 questions, with score ranging from 0 (not at all/not relevant) to 3 (very high). Summation of the scores is categorized into 4 levels of quality of life, namely, no effect at all (0-1), small effect (2-5), moderate effect (6-10), and extremely large effect (21-30) (Finlay and Khan, 1994). DLQI (Thai version) was validated before application to the participants.

Data analysis

Data were analyzed using a Statistical Package for the Social Sciences (SPSS) software version 18.0 (IBM, Armonk, NY). Continuous data were presented as mean with standard deviation (for normally distributed data), or median with interquartile range (for non-normally distributed data). Categorical data were

presented as numbers and percentage. Logistic regression analysis was used to determine risk factors associated with dermatological problems of participants returning from travel abroad. Factors with p -value < 0.10 on univariate analysis were further analyzed using multiple logistic regression analysis. A p -value < 0.05 was considered statistically significant.

RESULTS

From February 2018 to January 2019, 270 Thai travelers who met the inclusion criteria and could be contacted following their return were enrolled in the study. The mean age was 39 years, nearly equally divided between females and males, major destinations were Asia [India (19%)] and Africa [Kenya (15%)] mainly as tourists (nearly divided between group tours and backpackers), majority staying a median of 11 days (range 2-54 days), and 18% had experienced previous skin problems (Table 1). The majority of participants (69-79%) correctly answered all five questions on possible travel-related dermatological problems (Table 2).

During the participants' stay abroad the large majority (79-97%) avoided risk behaviors for skin problems (unprotected sun exposure and activities in public sea/fresh water areas) (Table 1). Nevertheless, 65 (24%) participants reported acquiring skin problems, mostly dry skin ($n = 28$), mostly those returning from Asia ($n = 13$) but those from Europe/North America/Australia/New Zealand ($n = 6$) constituted 29% of travelers visiting these locations, followed by arthropod bite ($n = 9$), 89% of which were reported by participants returning from Africa and South America, sunburn ($n = 7$), 86% of which were also reported by participants returning from Africa and South America,

Table 1
Demographic characteristics of participants travelling abroad.

Characteristic	Number (%) (<i>n</i> = 270)
Gender	
Male	121 (44.8)
Female	149 (55.2)
Age	
Mean; range	39; 18-71
18-30 years	83 (30.7)
>30 years	187 (69.3)
History of previous skin disease	
Yes	50 (18.5)
No	220 (81.5)
Duration of travel, days	
≤14	193 (71.5)
>14	77 (28.5)
Destination	
Asia	99 (36.7)
Africa	91 (33.7)
South America	59 (21.8)
Europe/North America/Australia/New Zealand	21 (7.8)
Type of travel	
Backpacking	156 (57.8)
Group tour	114 (42.2)
Purpose of travel	
Tourism	191 (70.7)
Business/work	41 (15.2)
Visiting friends/relatives	6 (2.2)
Research/study	25 (9.3)
Religious/pilgrimage	7 (2.6)
Risk exposure	
Sun bathing	9 (3.3)
Sea/public fresh water area activity	11 (4)
Outdoor activity without protection from sun exposure	56 (20.7)
No report of having risk	194 (72.0)

and eczema (*n* = 6), 67% of which reported by participants returning from Asia and Europe/North America/Australia/New Zealand (Table 3).

Although univariate analysis showed skin problems are statistically linked to

age (>30 years old), duration of travel (>14 days), travel destination (Europe/North America/Australia/New Zealand), type of travel (backpacking), purpose of travel (research/study) and risk exposure (sun bathing, sea/public fresh water area

Table 2
Knowledge of travel-related dermatological problems of participants ($n = 270$).

Question	True Number (%)	False Number (%)	Do not know Number (%)
1: Walking barefoot leads to risk of cutaneous larva migrans	203 (75)*	25 (9)	42 (16)
2: Some drugs can cause photosensitivity.	204 (76)*	1 (<1)	65 (23)
3: Exposure to sunlight before 10:00 hour should be avoided.	26 (10)	213 (79)*	31 (11)
4: Being bitten by tick or mite does not cause disease in humans	30 (11)	187 (69)*	53 (20)
5: Swimming in public fresh water area can lead to risk of parasitic infection	219 (81)*	13 (5)	38 (14)

*Correct answer.

Table 3
Common dermatological problems of participants returning from travel abroad.

Dermatological problem	Region visited by participants Number (%)				
	Asia ($n = 99$)	Africa ($n = 91$)	South America ($n = 59$)	Europe/North America/ Australia/ New Zealand ($n = 21$)	Total Number (%) ($n = 270$)
Dry skin	13 (13)	3 (3)	6 (10)	6 (29)	28 (10)
Arthropod bite	1 (1)	4 (4)	4 (7)	0 (0)	9 (3)
Sunburn	0 (0)	3 (3)	3 (5)	1 (5)	7 (2)
Eczema	2 (2)	1 (1)	1 (2)	2 (9)	6 (2)
Skin change due to physical factor	2 (2)	0 (0)	1 (2)	1 (5)	4 (1)
Acne	2 (2)	0 (0)	0 (0)	2 (9)	4 (1)
Seborrheic dermatitis	2 (2)	0 (0)	1 (2)	0 (0)	3 (1)
Skin tanning	0 (0)	1 (1)	0 (0)	0 (0)	1 (<0.5)
Keratosis pilaris	0 (0)	1 (1)	0 (0)	0 (0)	1 (<0.5)
Paronychia	0 (0)	0 (0)	1 (2)	0 (0)	1 (<0.5)
Contact dermatitis	1 (1)	0 (0)	0 (0)	0 (0)	1 (<0.5)

activity, and outdoor activity without protection against sun exposure (Table 4). Subsequent multivariate analysis revealed travel destination (Africa) and outdoor activity without protection against sun exposure are independent

factors statistically associated with skin problems (Table 4).

A DLQI test was carried out among participants ($n = 50$) who developed skin problems, showing 38% considered the dermatological conditions (arthropod

Table 4
Risk factors associated with dermatological problems of participants returning from travel abroad .

Factor	Reported skin problem Number (%) (n = 65)	No report of skin problem Number (%) (n = 65)	Univariate analysis	Multivariate analysis
			OR (95% CI)	Adjusted OR (95% CI)
Gender				
Male	25 (38)	96 (47)	1	-
Female	40 (62)	109 (53)	1.41 (0.80-2.49)	-
Age, years				
18-30	30 (46)	53 (26)	1	1
≥30	35 (54)	152 (74)	2.46 (1.38-4.39)	1.88 (0.89-3.97)
Duration of travel, days				
≤14	30 (46)	163 (79)	1	1
>14	35 (54)	42 (21)	4.53 (2.50-8.20)	2.40 (0.96-6.01)
Destination				
Asia	23 (35)	76 (37)	1	1
Africa	13 (20)	78 (38)	0.56 (0.26-1.17)	0.28 (0.10-0.77)
South America	17 (26)	42 (20)	1.34 (0.64-2.78)	0.96 (0.32-2.89)
Europe/North America/ Australia/New Zealand	12 (19)	9 (5)	4.41 (1.65-11.76)	2.85 (0.73-11.07)
Type of travel				
Backpacking	49 (75)	107 (52)	1	1
Group tour	16 (25)	98 (48)	0.36 (0.19-0.67)	0.91 (0.41-2.01)
Purpose of travel				
Tourism	50 (77)	141 (69)	1	1
Business/work	2 (3)	39 (19)	0.145 (0.03-0.62)	0.30 (0.06-1.54)
Visiting friends/relatives	0 (0)	6 (3)	-	-
Research/study	12 (19)	13 (6)	2.60 (1.11-6.10)	1.51 (0.48-4.77)
Religious/pilgrimage	1 (1)	6 (3)	0.47 (0.05-4.00)	0.65 (0.06-7.76)
Risk exposure				
Sun bathing			1	1
No	60 (92)	201 (98)	4.19 (1.09-16.09)	1.15 (0.22-6.08)
Yes	5 (8)	4 (2)		
Sea/public fresh water area activity				
No	58 (89)	201 (98)	1	1
Yes	7 (11)	4 (2)	6.07 (1.71-21.44)	1.46 (0.31-6.98)
Outdoor activity without protection from sun exposure				
No	45 (69)	169 (82)	1	1
Yes	20 (31)	36 (18)	2.09 (1.10-3.95)	2.88 (1.22-6.79)

CI: confidence interval; OR: odds ratio.

bite, dry skin, eczema, and sunburn) had only a small effect on their quality of life (Table 5). No significant association between DLQI and gender, age or travel destination was discerned (data not shown).

DISCUSSION

This is the first prospective study of travel-related skin problems encountered by travelers returning to Thailand from trip to Africa, Asia, South America and Europe/North America/Australia/New Zealand (these latter destinations being grouped together due to the small number of participants going to these regions). The participants had a good level of knowledge of travel-related dermatological problems, in contrast in travelers from (Belgium, Germany, Greece, Italy, Netherlands, Spain, Sweden, Switzerland, England, Japan, Greece and Italy in earlier studies (Van Herck *et al*, 2004; Namikawa *et al*, 2010; Pavli *et al*, 2014; Adou *et al*, 2019). The majority of these travelers are from non-tropical countries and may have less awareness of skin infections. In addition, participants in our study were recruited from those visiting the Travel Clinic, Faculty of Tropical Medicine, Mahidol University

indicating that they were already aware of possible dermatological problems they might encounter at their travel destinations and sought advice from specialists in travel medicine (accounting for the small number of recruits bound for Europe/North America/Australia/New Zealand).

The percent returning travelers experiencing skin problems in our study was higher than reported (0.6-17%) in previous studies (Hill, 2000; Mizuno and Kudo, 2009; Hagmann *et al*, 2014; Piyaphanee *et al*, 2014; Stevens *et al*, 2015). Our study included not only skin disorders but all non-normal dermatological conditions experienced by the participants, *eg* dry or tanned skin. All skin abnormalities were photographed and sent to the Travel Clinic for diagnosis by dermatologists. The most common dermatological condition experienced by participants in the present study was dry skin, defined as a feeling of dryness, skin rough or dry to touch, redness, cracking, and/or appearance of fish-like scales (ichthyosis). Causes of dry skin are exposure to dry and/or cool ambient air and hot water (from taking shower or bath), conditions commonly experienced in Europe/North America/Australia / New Zealand.

Table 5
Association between dermatology life quality index and dermatological problems of participants returning from travel abroad.

Dermatological problem	Number	No effect Number (%)	Small effect Number (%)	Moderate to very large effect Number (%)
Dry skin	28	15 (54)	9 (31)	4 (14)
Arthropod bite	9	6 (67)	3 (33)	0 (0)
Sunburn	7	2 (29)	4 (57)	1 (14)
Eczema	6	2 (33)	3 (50)	1 (17)

Arthropod bite is one of the most common causes of skin lesions, especially in travelers returning from tropical regions (Hochedez *et al*, 2009; Morris-Jones and Morris-Jones, 2012). Similarly, arthropod bite constituted the highest proportion of dermatologic problems in participants traveling in Africa.

Sunburn in travelers is generally related to the area of visit and travelers' Fitzpatrick skin type (Zaidi, 2017). Among French travelers to Senegal, 36% experienced sunburn (Dia *et al*, 2010), whereas, sunburn among Chinese residents in Hong Kong returning from travel to possible risk regions is 3.6% (Abdullah and Hamer, 2006), similar to the proportion among our participants. Caucasians with skin types I and II face a higher risk of sunburn, while types V and VI (Asian) are at the lower risk (Ravnbak, 2010; Hall *et al*, 2003; Zaidi, 2017; Kawada 2000).

Travelers who participate in such winter activities as climbing, skiing and trekking may neglect proper use sun protection including sunscreens. Exposures to UV light at high altitudes and from reflections from snow and ice (up to 90% of UV light), are significantly greater than reflections sand (15-30%) and seawater (Diaz and Nesbitt, 2013). In our study, outdoor activities without protection from exposure to sun posed a greater risk of dermatological problem compared to sun bathing and sea water activities, which participants were more aware of the need for skin protection against sunburn.

The Thai version of DLQI was used in this study to determine the impact of dermatological problems. To the best of our knowledge, this study is the first to use DLQI with returning travelers. We

found DLQIs of participants with eczema were lower than in previous studies as the latter evaluations were conducted in hospitals indicating those interviewed have severe symptoms (Badia *et al*, 1999; Le *et al*, 2019). In our study, participants sent photographs of their skin conditions, but did not alter their travel schedules or sought medical treatment during their travel or upon their return.

The study suffers from two major weaknesses. Firstly, participants were recruited from those visiting the Travel Clinic, Faculty of Tropical Medicine, Mahidol University, constituting those who were cognizant of potential skin problems encountered at their travel destination and risk behaviors, thereby resulting in a biased data set from that expected from the Thai traveler at large. Secondly, this was a self-reporting questionnaire-based follow-up study of participants on Days 7 and 14 post-return, thereby dependent on ability of respondents to recall the requested information and subject to perceived skin conditions rather than the actual signs and symptoms.

In summary, this prospective study reveals 24% of participants upon their return from trip abroad reported experiencing dermatological problems during their travel, the most common conditions being dry skin (10%), followed by arthropod bite (3%), sunburn (2%), and eczema (2%), corresponding to their risk exposures, 50% of whom reporting impairment (ranging from small to large) of quality of life. Multivariate analysis reveals outdoor activity without protection against sun exposure and stay >14 days in Europe/North America/Australia/New Zealand were independent factors associated with skin problems. Thus, despite the majority of participants having a good level of

knowledge of possible travel-related skin problems, pre-travel advice according to travel destination should nevertheless be provided, including contents of medical kits appropriate for travel destination and type of outdoor activity.

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