Risk and Spectrum of Diseases in Travelers to Popular Tourist Destinations

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Background: Traveling to tropical regions is related to increased health risks. Travelers' diarrhea is the most frequent health problem, but the range of travel-related diseases also includes potential life-threatening diseases such as malaria. The actual risk of European travelers acquiring specific infectious diseases and other hazards in the tropics is to a large extent unknown and is therefore often adopted from that of the indigenous population.

The objective of this study was to elucidate the risk for travel-related diseases, symptoms, and accidents in a population of Europeans who travel to popular tourist destinations.

Methods: From July 2003 to June 2004, 794 travelers consulting the travel clinic of the Berlin Institute of Tropical Medicine were recruited for a questionnaire-based observational study before traveling to Kenya, Tanzania, Senegal, the Gambia, India, Nepal, Thailand, or Brazil.

Results: Overall, illness was reported by 42.9% of travelers, with 10.2% reporting more than one adverse health event. Most frequently gastrointestinal symptoms were noted (34.6%), followed by respiratory symptoms (13.7%). More than 5% experienced an accident.

Travel to the Indian subcontinent nearly doubled the risk of becoming ill; travel to Thailand significantly decreased the risk. Additional risk factors were a long duration of staying abroad, young age, and traveling under basic conditions. Of all travelers, 80% did not follow the traditionally recommended dietary restrictions. Among travelers visiting malaria-endemic areas, 20% did not carry any antimalarial drugs with them, not continuous chemoprophylaxis or standby medication.

Conclusions: Because of the rising travel activity, especially to tropical countries, the importance of qualified pretravel advice consultation is increasing. To improve the travelers' health, attention needs to be paid to individual risk factors, the prevention and therapy of travelers' diarrhea, malaria prophylaxis, management of respiratory illness, and personal safety.

International travel has become increasingly popular. Each year about 4.1 million Germans travel to developing countries and are exposed to a variety of health hazards.[1]

Infectious diseases are of particular importance. Travelers' diarrhea is the most frequent health problem, occurring in 13.6 to 54.6% of travelers, depending on travel conditions and destination.[2–9] Travelers' diarrhea is, in most cases, mild and self-limiting, but can affect the well-being during a journey. The range of travel-related diseases also includes potential life-threatening diseases such as malaria and dengue fever.

The actual risk for European travelers to acquire specific infectious diseases and other hazards in the tropics is, to a large extent, unknown. Therefore, in pretravel advice practice, the morbidity and mortality numbers of the local population are often used. This can lead to substantially false estimates, as has been shown in recent years regarding malaria prophylaxis.[10] Based on the results of studies on the risk for malaria in travelers, malaria prophylaxis guidelines have been modified.

Several studies have examined the epidemiology of travelers' diarrhea and the incidence of malaria in returned travelers.[2–5,11–14] However, there is little prospective information on the spectrum of travel-related diseases, the occurrence of accidents, and possible differences between tropical regions.[6,15,16]

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The risk of most travel-related diseases can be significantly reduced by applying preventive measures, but many travelers are unaware of their travel health risks.[17] Therefore, qualified pretravel advice on specific health risks in the tropics and preventive measures, such as food hygiene, vaccinations, and malaria prophylaxis, is important.

The objective of this study was to elucidate the risk for travel-related diseases, symptoms, and accidents in a population of Europeans who travel to popular tourist destinations. Specific health behaviors, preventive measures, travel destination, and duration were assessed as probable risk factors.

Subjects and Methods

The study was conducted at the travel clinic of the Berlin Institute of Tropical Medicine. From July 2003 to June 2004, 794 travelers were recruited before traveling to tropical countries. Five popular tropical regions or countries were selected: Kenya/Tanzania, Senegal/the Gambia, India/Nepal, Thailand, and Brazil. Exclusion criteria were age < 18 years, traveling for more than 2 months, and major acute or chronic diseases.

Enrolled travelers received a questionnaire (four pages with 32 questions) after their return. The questionnaire addressed travel history and characteristics, travel experience, preventive measures, and risk behaviors. In addition, information concerning the occurrence of diarrhea, fever, respiratory symptoms or other health problems, accidents, and the need for medical care were requested.

Data were collected pseudonymously and analyzed with SPSS version 12.0. Data are presented as the mean ± SD or median. Comparisons between groups were performed using the chi-square test for binary or categoric variables and a two-tailed *t*-test or the Mann-Whitney *U* test for continuous variables. Correlations between continuous variables were expressed as a Pearson correlation. A p value < .05 was defined as being statistically significant, and a p value < .01 as highly significant. To compare the impact of travel destinations, persons who traveled to a specific destination were compared versus those who did not travel to that destination.

Results

Study Population

From July 2003 to June 2004, 823 travelers who intended to travel to one of the selected tropical areas were recruited. We excluded 29 subjects who later changed their travel plans, leaving 794 persons enrolled. Follow-up was obtained on 658 (83%) travelers. Characteristics of the study population and travel demographics are described in Table 1. Comparing the different destinations, significantly more backpackers traveled to Thailand and India/Nepal (p < .01). All other characteristics did not differ between the countries.

Risk Behaviors

The risk behaviors during travel are presented in Table 2. Travelers to Brazil and to Thailand reported significantly more frequent risky behavior than did travelers to other destinations (p < .01). Travelers to India reported significantly fewer risks, particularly fewer food risks (p < .01). The risk to acquire schistosomiasis through contact with freshwater was not the same for all destinations and was very low in Thailand and India. Excluding those countries, 72 (11%) persons were at risk for schistosomiasis. In Kenya/Tanzania, 19.2% reported contact with freshwater. Most risk behavior by "animal contact" involved insect bites (ie, ticks, fleas); five travelers reported bites from a monkey, dog, or cat. Young persons traveled for longer periods of time (p < .01), had less travel experience (p < .01), and reported more health risks than did older travelers (p < .01). No association was found between travel experience (previous travel to tropical countries) and risk behaviors (p = .505).

Antimalarial Chemoprophylaxis

Four hundred ninety-five (75.2%) travelers took protection against mosquitoes, such as using bed nets and repellents; 276 (41.9%) travelers took malaria chemoprophylaxis as follows:

- Chloroquine (0.7%)
- Chloroquine in combination with proguanil (1.8%)

Table 1 Characteristics of the Study Population and Travel Demographics

Characteristic	n
Travelers studied	658
Age (yr) ± SD	40.3 ± 13.5
Range (yr)	18–80
Sex	
Male	318 (48.3%)
Female	340 (51.7%)
Destination	
Brazil	82 (12.5%)
India/Nepal	164 (24.9%)
Kenya/Tanzania	167 (25.4%)
Senegal/the Gambia	34 (5.2%)
Thailand	211 (32.0%)
Duration of travel (d)	23.9 ± 10.3
Range (d)	3–62
Travel conditions	
Basic (backpacker)	287 (43.6%)
Good (hotel)	371 (56.4%)
Travel insurance	586 (86.3%)
Previous travel to tropical countries	404 (61.4%)

Table 2 Risk Behaviors*

Behavior	n *(%)*
Swimming/contact in/with freshwater	161 (24.5)
Food risk	519 (78.9)
Tap water	77 (11.7)
Raw vegetables/salad	500 (75.9)
Raw milk	42 (6.4)
Raw meat/fish	64 (30.3)
Animal contact (except mosquito bites)	36 (5.5)
Unsafe sex	10 (1.5)

*n = 658.

- Doxycycline (5.8%)
- Atovaquone/proguanil (31.2%)
- Mefloquine (60.5%)

Of these 276 travelers, 268 (97.1%) reported the regular use of antimalarial drugs. Two hundred forty (36.5%) carried a standby medication with them, in most cases, atovaquone/proguanil (64.6%), followed by mefloquine (20%), artemether/lumefantrine (11.7%), and chloroquine (0.4%). Two of those travelers took a treatment for suspected malaria. One hundred thirty-two (20.1%) travelers did not carry any antimalarial drugs with them, not continuous chemoprophylaxis or standby medication. Figure 1 shows the malaria prophylaxis use by travel destination. Side effects were reported by 80 (28.9%) of 276 travelers with malaria prophylaxis, which affected the journey in 27 (9.8%) cases. In users of mefloquine, the most common side effects were central nervous system problems, such as headache, dizziness, sleep disorders, and emotional lability (53 of 167 [31.7%]). These kinds of side effects occurred significantly more often with mefloquine than with other antimalarial drugs (31.7% vs 8.6%, $p < .01$). Of those patients on atovaquone/proguanil and doxycycline, gastrointestinal side effects were most frequent (15.1% and 25%, respectively). Dermatologic problems occurred significantly more often with doxycycline than with any other antimalarial drug (12.5% vs 1.5%, $p < .01$).

Illness during Travel

Illness during travel was reported by 42.9% of the travelers, with 10.2% reporting more than one adverse health event. The mean duration of disease was 5.9 ± 6.6 days. The most frequent symptoms are listed in Table 3; travelers could indicate several symptoms.

Figure 2 displays the odds ratio (OR) for illness by travel destination. Travel to India/Nepal nearly doubled the risk of becoming ill (55.5% of travelers became ill; OR = 1.66, 95% CI 1.3–2.2, $p < .01$). On the other hand, travel to Thailand significantly decreased the risk (34.6% of travelers became ill; OR = 0.71, 95% CI 0.6–0.9, $p < .01$). When travelers to India/Nepal are compared with travelers to each individual destination, similar results are obtained.

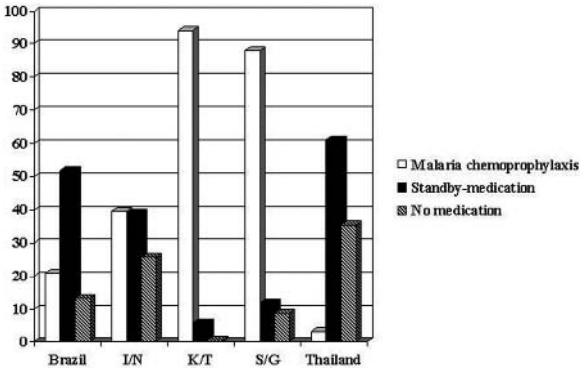

Figure 1 Malaria prophylaxis use (percentages) in a population of German travelers. I/N = India/Nepal; K/T = Kenya/Tanzania; S/G = Senegal/the Gambia.

The differences in risk for illness were also found for each individual symptom, such as diarrhea, respiratory symptoms, and fever ($p < .01$). Travelers who reported an illness were younger ($p < .05$), traveled more often under basic conditions ($p < .01$), and had a longer duration of travel ($p < .01$) than did those who remained well. No association was found between illness and sex or travel experience ($p = .84$ and $p = .29$, respectively). A correlation between food hygiene and illness, particularly between food hygiene and diarrhea, was not found ($p = .51$ and $p = .66$, respectively). As an exception, travelers to India who had not followed the traditionally recommended dietary restrictions showed a twofold increased risk of illness (OR = 2.04, 95% CI 1.09–3.81, $p < .05$).

Medical Care

Forty-four (15.6% of 282 travelers reporting illness) travelers reported having sought medical care owing to illness or accident during their stay. One traveler was admitted to a hospital, and one traveler was transported back to Germany. Forty-three (97.7%) of those who sought medical care were content with their treatment. The most common diagnoses were gastroenteritis (36.4%), pharyngitis or bronchitis (13.7%), and skin diseases (9.1%).

Table 3 Reported Illness during Travel*

Symptoms	n *(%†)*
Gastrointestinal	228 (80.9/34.6)
Respiratory	90 (31.9/13.7)
Fever	41 (14.5/6.2)
Dermatologic	27 (9.6/4.1)

*n = 658.
†Percent of travelers who reported illness/percent of all travelers.

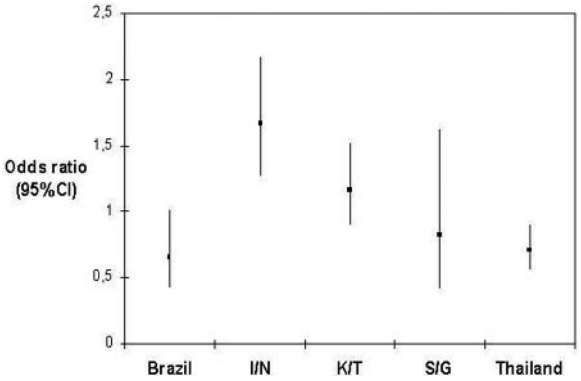

Figure 2 Odds ratios of developing illness by travel destination compared with those who did not travel to that destination ($p < .01$). I/N = India/Nepal; K/T = Kenya/Tanzania; S/G = Senegal/the Gambia.

Most frequently, antibiotics were prescribed (38.6%), followed by antidiarrheals (15.9%) and local medicine (6.8%) such as ayurveda.

Of the travelers who reported an illness, 169 (60%) chose to treat themselves. Most of them used over-the-counter symptomatic drugs (such as loperamide), mostly against diarrhea (58.3). Only 13 travelers self-treated with antibiotics.

Ninety-nine persons (35.1% of those reporting illness; 15% of all travelers) reported a loss of 3.4 ± 3.0 holiday days owing to illness.

Accidents during Travel

Thirty-four travelers (5.2% of all travelers) sustained an accident, of which 23 (67.6%) had minor injuries owing to sporting activities, such as diving or snorkeling, and 8 (23.5%) were involved in vehicular accidents. Seven of the 34 travelers required medical care for their injuries, 2 were admitted to a hospital, and 1 had to be transported back to Germany.

Four travelers experienced a robbery or an assault. Travelers who reported an accident were younger than those without an accident ($p < .05$). No association was found between accident occurrence and sex ($p = .85$), travel conditions ($p = .41$), travel duration ($p = .25$), risk behavior ($p = .11$), or travel experience ($p = .34$).

Discussion

Because of the increasing travel, especially to tropical countries, the importance of qualified pretravel advice consultation is increasing. However, it is estimated that around 50% of all European travelers receive information about travel-related risks but that only 14% of travelers consult a travel health clinic.[18,19] Therefore, other institutions, particularly family physicians, are also important in the field of travel medicine, and further training is advised.

The objective of this study was to investigate the characteristics of a European travel population and to elucidate the risks for travel-related diseases, symptoms, and accidents in different tropical countries. This study included only travelers who consulted a travel clinic prior to departure, and therefore not the entire population of people traveling to developing countries. We assume that people who visit the travel clinic are more aware and concerned about possible medical problems and are willing to take precautions to prevent them. However, this study examined a wide range of travel-related diseases and probable risk factors, and supplies data that can be useful regarding existing pretravel health advice.

Of all the travelers, 80% did not follow the traditionally recommended dietary restrictions. A similarly poor adherence to recommendations has been reported in other studies.[8,20–22] In contrast, when comparing the data of the five destinations, nearly 50% of travelers to India followed the recommended dietary restrictions. Steffen and colleagues reported airport survey results that demonstrated higher compliance with keeping food hygiene in travelers to India and Kenya versus those to Brazil and Jamaica.[3] It is possible that travelers correctly consider certain tropical countries to be high-risk areas and adapt their behavior.

Of those who visited regions endemic for schistosomiasis, 11% reported contact with freshwater. But in Kenya/Tanzania, an area with a high prevalence of schistosomiasis, nearly 20% of travelers reported contact with freshwater. As a consequence, the risk of acquiring schistosomiasis should be pointed out, particularly to travelers to Africa.

Young travelers and travelers with a long duration of travel reported more health risks than did older travelers. In other studies the same association was found.[3,21] Young people tend to travel for longer time periods, and the increased risks in long-term travelers can simply be explained by the accumulation of risk over time. In addition, the longer the time spent traveling, the more difficult it is to avoid fresh salads or ice cream.

As a fact of major concern, 20% of travelers visiting malaria-endemic areas did not carry any antimalarial drugs with them, not for continuous chemoprophylaxis or for standby medication. This is a high percentage taking into consideration that the recommendation of adequate malaria prophylaxis is of particular importance in pretravel health advice and is given to all participants who consult the travel clinic.

Many travelers fear the side effects of antimalarial drugs, particularly neuropsychiatric problems with meflo-

quine. On the one hand, this could lead to lower compliance with antimalarials; on the other hand, an increased perception of possible side effects could result. Side effects of antimalarial drugs were reported by 80 out of 276 (28.9%) travelers and affected the journey in 27 (9.8%) cases. Other studies indicate lower rates; Hill reported side effects in 4% of travelers with malaria prophylaxis.[15]

An illness was reported by 42.9% of travelers. In comparison, other studies report a 49 to 70% morbidity rate.[6,9,15] The population of Israeli travelers with a reported 70% incidence of illness is different from our study population[6]; therefore, it is difficult to compare data. The Israeli travelers were younger and traveled for longer periods of time. Both age and travel duration are known as potential risk factors for illness and can explain the higher frequency of illness. Gastrointestinal symptoms, experienced by 34.6% of the travelers in our study, were the most common complaints during travel. This percentage is similar to that of other studies in which the range is 13 to more than 50%, 30 to 40% in most comparable studies, depending on the travel conditions and destinations.[3–7,9,11,15,20,22,23]

Comparing the different destinations, travel to India/Nepal nearly doubled the risk of becoming ill, whereas travel to Thailand significantly decreased the risk. Hill found similar differences by travel destination in a group of American travelers to tropical regions.[15] Travel to the Indian subcontinent more than doubled the risk of becoming ill. Differences by travel destination are also known relative to the incidence of travelers' diarrhea. The highest risk for diarrhea is reported from travelers to India, the Middle East, and Maghreb countries. Travel to Southeast Asia seems to present less of a risk for travelers' diarrhea.[2,3,5,23]

In addition, correlations between illness and age, travel conditions, and travel duration were found. Young persons traveling under basic conditions and for longer periods of time were at increased risk for becoming ill. Other studies have shown the same correlations, particularly pertaining to age and travel duration as risk factors.[2–7,9,15,24] Some studies have reported an association between illness and sex or travel experience,[8,15] but we did not find a similar association.

A correlation between food hygiene and illness, particularly between food hygiene and diarrhea, was not found when looking at the total study population. Travelers to Thailand and Brazil reported the lowest compliance in food hygiene but also the lowest incidence of illness. These findings are in agreement with most other studies,[3,4,21,24] but some studies indicate an association between low food hygiene and morbidity.[6,20,23] This is the first study to examine this relationship by travel destination. Interestingly, we found a correlation for travelers to India. Those who had not followed the traditionally recommended dietary restrictions showed a twofold increased risk of illness. Travelers to India did not differ in age and travel characteristics from those to other countries, particularly Thailand. Thus, it can be assumed that low food hygiene can be a risk factor for illness and diarrhea, but not in all regions. Keeping food restrictions may be useful and protective in travelers to India, a high-risk area for diarrhea.

Of those travelers who sought medical care during their stay, 36.4% reported diarrhea, but a high number reported respiratory tract symptoms. Therefore, it is appropriate to counsel travelers to carry symptomatic treatment for respiratory infections. Other adverse health events occurred with lower frequency, although their implications remain important.

When morbidity and mortality are examined in overseas travelers, accidents account for 20 to 25% of deaths, whereas infectious diseases account for only 2% of deaths.[25,26] Education about personal safety is a critical part of pretravel advice. Thirty-four (5.2%) of the travelers in our study experienced an accident, of which 7 required medical care. Two travelers were admitted to a hospital, and 1 needed to be transported back to Germany. However, only 1 traveler was admitted to a hospital and 1 had to be transported back to Germany owing to illness, which was reported by 42.9% of the travelers.

Conclusions

This study defines the range of travel-related health problems in a group of Germans traveling to tropical regions. Based on the results, pretravel advice consultation can be evaluated and optimized. To improve travelers' health, more attention needs to be paid to individual risk factors, the prevention and therapy of travelers' diarrhea, malaria prophylaxis, management of respiratory illness, and personal safety.

Declaration of Interests

The authors state they have no conflicts of interest.

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