
Respiratory Infections in Travelers Returning from the Tropics

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Abstract

Respiratory tract infections (RTIs), beside diarrheas, skin lesions, and fevers of unknown origin, are one of the most common health problems acquired by travelers going to tropical and subtropical countries. Visitors to African, Asian, or South American destinations, typically characterized by harsh environmental conditions and poor sanitation standards, are at risk of exposure to a large number of pathogens causing infectious diseases. The infections are transmitted from contaminated food and water, through the air, direct contact, or by insects. The main modes of RTIs transmission include droplet infection and direct contact. The clinical spectrum of RTIs in travelers is broad, from upper respiratory tract infections, pharyngitis, bronchitis, pneumonia, to influenza-like illness. The spectrum of microbial agents causing respiratory infections include numerous viruses and bacteria, rarely fungi, and parasites. Most travelers complain of mild infections, only a small minority seek medical assistance and report to health care facilities. Because of the risk of importing pathogens into Europe or North America and transferring them onto the local population, it is important to present the scale of the problem in relation to rapid development of tourism industry and an increasing number of intercontinental journeys. The aim of the study

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was to discuss the occurrence of travel-related respiratory infections among representatives of temperate climate traveling to and returning from the tropics.

Keywords

Respiratory infections • Travelers • Tropics

1 Introduction

The number of travelers from developed European and North American countries to regions lying in a hot climate zone is growing every year. Over the last few decades, the world has become a global village. Nowadays, everybody travels: small children, the elderly, pregnant women, the disabled, and even the chronically ill. People travel for various reasons, e.g. business, research work, tourism, but the majority of travelers are holiday-makers. The risk of acquiring an infection during long-distance travel depends on a number of factors, including the degree of endemicity in a visited part of the world, health condition of a traveler (proper functioning of the immune and thermoregulatory system, or history of chronic diseases), undertaking appropriate measures of health prevention, the length of stay, or types of activities to be undertaken in the destination country (Korzeniewski 2014).

Visitors to areas characterized by harsh climatic conditions and low standards of sanitation run the risk of exposure to vector-borne, food and water-borne and respiratory pathogens, which are rarely found in the temperate climate zone (Leder et al. 2013). Some travelers from industrialized to developing countries suffer health problems which are directly related to foreign travel. A vast majority of travelers complain of mild illnesses and only a small minority seek medical assistance and report to health care facilities. Travelers most commonly complain of diarrheas, skin lesions, fevers of unknown origin, and respiratory infections (Harvey et al. 2013).

The aim of this article is to discuss the occurrence of travel-related respiratory infections

among representatives of temperate climate traveling to and returning from the tropics.

2 Epidemiology of Respiratory Tract Infections Among Travelers in the Tropics

About 50 million people travel each year from industrialized countries to tropical or subtropical destinations (Herbinger et al. 2012). Travel to the tropics carries a high risk of morbidity, estimated at 20–70 % (Stienlauf et al. 2005). Worldwide, 8 % of travelers to developing countries report becoming ill enough to seek professional health care during or after travel (Harvey et al. 2013).

Respiratory tract infections (RTIs) are one of the most common travel-related health problems. The significance of RTIs in travelers stems from their high frequency and the year-round presence of pathogens, both the cosmopolitan pathogens and the less-known, yet potentially life-threatening ones (Meltzer and Schwartz 2009). The types of RTIs affecting travelers are usually similar to those observed in the local population, exotic cases are considered a rare event, and most cases are caused by cosmopolitan pathogens (Matteelli et al. 2005). The clinical spectrum of RTIs in travelers is broad. In the group of 1,719 international travelers returning with respiratory infections (7.8 % of all studied group), the main clinical presentations were non-specific upper RTIs (diagnosed in 47 % of the patients), bronchitis (20 %), pneumonia (13 %), pharyngitis (13 %), and influenza-like illnesses (5 %) (Leder et al. 2003). Among 540 Italian patients hospitalized with a history of travel and fever, RTIs were diagnosed in 40 patients (7 % of the

febrile patients) and the most common RTIs were pneumonia (35 %) and tuberculosis (15 %) (Matteelli et al. 2005). The spectrum of microbial agents causing RTIs had been previously described and include numerous viruses (influenza, parainfluenza, respiratory syncytial virus, metapneumovirus, adenovirus, rhinovirus, and coronavirus) and some bacteria (*Streptococcus* sp., *Mycoplasma pneumoniae*, *Legionella pneumophila*) (Pavia 2011).

The most common comprehensive registry of ill travelers returning from the tropics is the multinational GeoSentinel Surveillance Network. During September 1997–December 2011, the data were collected on 141,789 patients with confirmed or probable travel-related diagnoses. The most common reasons for travel were tourism (38 %), missionary/volunteer/research/aid work (24 %), visiting friends and relatives (17 %), and business (15 %). The most common regions of exposure were Sub-Saharan Africa (23 %), Central America (15 %), and South America (12 %). Of the 1,002 diagnoses in the respiratory grouping, 70 % were accounted for by five diagnoses: upper respiratory tract infection (27 %), acute bronchitis (18 %), acute sinusitis (11 %), bacterial pneumonia (lobar) (8 %), and asthma (6 %) (Harvey et al. 2013). In another GeoSentinel study on febrile patients, RTIs accounted for 14 % of all cases (Wilson et al. 2007). In the study of Freedman et al. (2006) in the same base, RTIs accounted for 77/1,000 travelers. Rack et al. (2005) have estimated the respiratory infections incidence among German travelers at 13.8 %, whereas among nearly 5,000 Scottish travelers at 16.8 % (Redman et al. 2006). In all these surveys, RTIs were second to diarrhea as the most prevalent health event during travel. In the study of Ansart et al. (2005), RTIs concerned 11.5 % patients coming from tropical countries. They mainly consisted of pulmonary infections, influenza-like illnesses, and ear, nose, and throat infections. The causes of pneumonia are multiple and include bacterial, viral, and fungal infections and also eosinophilic pneumonitis (related to the invasive stage of various helminthic infections) (Ansart et al. 2004).

Most cases of RTIs in travelers are upper respiratory tract infections (URTIs), which are mild and therefore unreported. The most common pathogens of URTIs are viruses, whose transmission and spectrum is similar in travelers and in the general population, with droplet infection and close contact accounting for most cases (Meltzer and Schwartz 2009). Camps et al. (2008) have diagnosed at least one virus from 56 % of travelers with fever and respiratory symptoms. The most frequent viruses detected were influenza virus (38 %), rhinovirus (23 %), adenovirus (9 %), and respiratory syncytial virus (9 %). Similar results were reported in German travelers, where again influenza was the most frequent isolate (Luna et al. 2007). In Swiss travelers, Mutsch et al. (2005) have established an incidence rate of influenza of 1 case/100 travel months, with 2.8 % overall incidence and 12.8 % among travelers with a history of febrile illness. Askling et al. (2009) studied 1,432 febrile travelers from Sweden who had returned from the tropics. For 21 % of the 115 patients with fever of unknown origin, serologic analysis showed that influenza was the major cause. People at risk of influenza include not only typical tropical travelers but also leisure and business travelers to countries in the temperate zone (including travel within their own country), where influenza is in season, regardless of whether the traveler falls into a usual risk group (Sato et al. 2000). The risk of travelers encountering influenza virus depends both on the travel destination and the time of year. In the temperate regions of the northern hemisphere (North America, Japan, or Europe), most influenza activity occurs from November through April. In the temperate regions of the southern hemisphere (Australia and New Zealand), most influenza activity occurs from April through October. In the tropics, influenza virus circulates at low levels year-round (Harper et al. 2005). Traveling presents unique opportunities for close contact with other travelers, many of whom may harbor influenza and other respiratory pathogens (Freedman and Leder 2005). Cruise ships, with their closed environments and large numbers of passengers from different countries, have been shown to present unusually high risk situations for viral

transmission. Attack rates for influenza-like illness (ILI) have ranged from 17 to 37 % in reported outbreaks (Brotherton et al. 2003). In practice, laboratory confirmation of influenza is performed relatively infrequently, it probably accounts for at least 5–6 % of respiratory illnesses reported in travelers (Leder et al. 2003). Other data support a suspicion that influenza may be the most common vaccine-preventable disease in travelers (Steffen et al. 2008). The largest annual transit of persons in the world is probably the Hajj. In a large survey among Hajj pilgrims in 2003, respiratory infections accounted for 40 % of all reported illnesses, and influenza virus accounted for the half of the isolated respiratory viruses (Balkhy et al. 2004). Because influenza is highly contagious and has a short incubation period, travel contributes considerably to the rapid spread of the virus (Hollingsworth et al. 2007). The World Health Organization (WHO) estimates that 5–15 % of the world population is affected by seasonal influenza viruses annually (Hill 2000). In Canada, the Committee to Advise on Tropical Medicine and Travel recommends influenza vaccination to all healthy travelers. WHO recommends annual vaccination only for travelers who are at high risk for complications of influenza. In the Netherlands, as in other European countries, influenza vaccination is already recommended for these risk groups, irrespective of travel (Belderok et al. 2013).

The spectrum of travel-related etiological agents of lower respiratory tract infections (LRTIs) depends on the region of the world. In Europe and North America the most common pathogen is *Legionella*, in Latin America *Histoplasma*, in Africa *Schistosoma*, and in Southeast Asia geohelminths. Legionellosis typically affects luxury tourism. Most cases are reported after travel to developed countries in Europe (Spain, France, and Italy) or North America. A specific form of travel that is frequently associated with legionellosis outbreaks is ship cruising (Meltzer and Schwartz 2009). In the European Union, the case fatality rate in travel-related legionellosis ranges between 3.8 and 5.6 % (Ricketts et al. 2006). One of the pathogens which is most actively imported to developed

countries, especially by immigrants, is *Mycobacterium tuberculosis*. The etiological factor of tuberculosis (TB) is easily transmitted via aerolized droplets in the crowded environments of aircrafts and airports, although outbreak investigations have found that the true infection rate under these conditions is quite low (Meltzer and Schwartz 2009). The risk of TB in tourists, especially in short-term travel, is not clearly established. Such cases were rarely reported to the GeoSentinel system, and indeed the odds ratio for TB was 66.7 in favor of immigrants and visiting friends and relatives (VFRs) as opposed to other tourists (Leder et al. 2006). Similar results are reported from France and Italy, where TB is essentially restricted to immigrants and VFRs, mostly from Africa (Ansart et al. 2005; Matteelli et al. 2005). The significance of TB as a travel-related disease is debated and still not fully recognized. TB has a specific importance among respiratory infections because it can spread through respiratory contact and requires strict isolation conditions in hospitals, and because there is an important threat of resistant cases (Matteelli et al. 2005). Although the prevalence of TB has greatly decreased in the temperate and developed counties of Western Europe, North America, Australia, and Japan, it remains a major disease burden in tropical and developing countries (Freeman et al. 2010; Corbett et al. 2003). Consequently, travelers and expatriates from low-prevalence nations who travel to or live in high prevalence nations may become infected with TB (Cobelens et al. 2000). There is still debate about the risk for latent tuberculosis infection (LTBI) that results from long-term travel (Toovey et al. 2007). Cobelens et al. (2000) suggested that the risk of acquiring LTBI to travelers is similar to that of the general population in the destination country. According to Rieder (2001), many apparent latent TB infections in travelers from low-incidence to high-incidence countries may be due to false positive tuberculin skin tests (TSTs) in this otherwise low-prevalence population. Pseudoepidemics of TST conversions in military populations have been reported in relation to travel (Mancuso et al. 2008).

Risk factors for the acquisition of RTIs during international travel are not clearly identified,

e.g. age, gender, trip duration, or reason for travel as a predictor for developing respiratory infections. O'Brien et al. (2001) reported a five times higher risk of pneumonia among travelers >40 years of age. In evaluating returning travelers, the first issue is to establish by a thorough medical interview whether respiratory complaints are indeed temporally associated with travel. The majority of patients presenting with post-travel respiratory symptoms fall into one of two major categories, an acute febrile diseases with respiratory signs or protracted post-travel respiratory symptoms (Meltzer and Schwartz 2009).

3 Post-travel Respiratory Symptoms in Returning Travelers

Respiratory tract infections are a significant cause of health problems, accounting for 7–11 % of consultations in returning travelers (Jaureguiberry et al. 2011; Freedman et al. 2006). The prevalence of RTIs is invariably higher in travelers presenting with fever, as respiratory infections account for 14–24 % of the etiologies of fever (Wilson et al. 2007). RTIs are the second most common cause of illness in travelers and of fever in returning travelers (O'Brien et al. 2001). Post-travel respiratory infections were reported among 25 % Israeli (Winer and Alkan 2002) and 26 % American travelers (Hill 2000). RTIs were also a reason of hospitalization among 24 % Australian febrile patients returning from the tropics (O'Brien et al. 2001). Pneumonia still accounts for many hospital admissions due to post-travel respiratory illnesses (Stienlauf et al. 2005). Most of the major causes of pneumonia have a global distribution. *Streptococcus pneumoniae*, *Hemophilus influenzae*, and *Staphylococcus aureus* are the dominant pneumonia isolates in developing countries. Some agents of travel-related pneumonia have a global distribution, but are reported infrequently. Q fever, e.g., is rarely diagnosed in travelers, and in fact has more often been associated with a non-specific febrile illness than with RTI. The majority of travel-related Q fever is

reported from Africa (Meltzer and Schwartz 2009). Some agents of travel-related pneumonia are rare in most developed countries and may, and thus may be missed by physicians if the travel itinerary is not taken into account. These include some helminthic, bacterial, and fungal respiratory infections (Meltzer and Schwartz 2009). In a study of Ansart et al. (2004), most cases of pneumonia were bacterial, with *S. pneumoniae*, *Mycoplasma*, and *Legionella*, but some etiologies included dengue, leptospirosis, tuberculosis, histoplasmosis, schistosomiasis, and Q fever. The majority of travelers with pneumonia will not differ from routine cases of community-acquired pneumonia (CAP). Yet increased exposure to hotels requires heightened alertness to the possibility of legionellosis. Travelers to East and Southeast Asia may be exposed to *Burkholderia pseudomallei*, the causative agent of melioidosis (Meltzer and Schwartz 2009). Severe pneumonia can also be associated with viral infections. Primary influenza pneumonia is, in fact, underreported, but during pandemic years it has accounted for 18 % of all influenza-associated pneumonia (Rothberg et al. 2008). Other rarely reported viral pneumonias in travelers include SARS and hantavirus pulmonary syndrome. Active tuberculosis is rarely diagnosed in returning travelers. Thus, when a traveler presents with fever and respiratory symptoms in the immediate post-travel period, he is very unlikely to be diagnosed with pulmonary TB (Meltzer and Schwartz 2009). Also, tropical diseases are not the leading cause of consultation in travelers from industrialized countries returning from the tropics. Immigrants from Africa, Asia, and South America are the travelers most at risk of common tropical diseases (Ansart et al. 2005).

It is important to remember that respiratory symptoms are not rare in systemic febrile illnesses that are not commonly associated with the respiratory tract. In malaria, respiratory symptoms occur in up to half of the patients and are not limited to cases with acute respiratory distress syndrome (Anstey et al. 2002). Similarly, cough is not rare in enteric fever and leptospirosis, which are sometimes initially mistaken for RTIs. Among patients with URTIs, fever and

cough with an acute onset are the definition of influenza-like illness. The patterns of influenza seasonality in travel medicine reflect the transmission pattern in the destination countries. It should be remembered that in many tropical countries influenza transmission is continuous rather than seasonal (Lowen et al. 2008).

Acute bacterial infections causing RTIs are usually accompanied by eosinopenia. Pneumonia with eosinophilia can be attributed to helminthic infections. Schistosomiasis manifests acutely as a combination of fever and respiratory symptoms, either with or without pulmonary infiltrates. Similarly, geohelminths (*Ascaris*, *Ancylostoma*, *Necator*, or *Strongyloides*) can cause an acute febrile episode with cough, again with or without lung infiltrates (Meltzer and Schwartz 2009). Respiratory symptoms in a febrile traveler should suggest the presence of common respiratory pathogens such as *S. pneumoniae*, influenza and other respiratory viruses, mycoplasma, and *Legionella pneumophila*. *L. pneumophila* infection can be acquired by travelers in spas, on cruise ships and in hotels (Habib and Behrens 2000). The presence of fever, pneumonia, and hepatitis should prompt consideration of Q fever (caused by *Coxiella burnetii* and associated with animal exposure) (Ryan et al. 2002). One in three febrile travelers is diagnosed with malaria. Therefore, it is important that during the diagnostic process, some consideration should also be given to this disease entity. In travelers returning from tropical or subtropical countries with a non-specific febrile illness it is necessary to perform the following tests: blood test by light microscopy, CBC with differential, AST, ALT, urinalysis, a chest X-ray, examination of stool specimens for parasites, tests for specific disease entities (e.g. HIV). Blood, urine and fecal cultures should also be considered. Another element which may turn useful during the diagnostic process is the incubation period (e.g., the onset of fever more than 3 weeks after returning from a journey virtually excludes the diagnosis of viral hemorrhagic fevers). Most illnesses manifest after a few days/weeks' incubation period. However, some illnesses (tuberculosis, schistosomiasis) have the incubation period of 6 months or more; hence, it is necessary to take

detailed history from patients returning from the tropics (Korzeniewski 2014).

4 Summary

Between 20 and 70 % of the people who travel from the industrialized countries to developing world each year experience a health problem associated with their journey. Respiratory tract infections (RTIs) are one of the most common travel-related health problems. The main modes of RTIs transmission include droplet infection and direct contact. The type of RTIs affecting people traveling to, and returning from, the tropics are usually similar to those observed in local populations. Tropical cases are considered a rare event (the main source of tropical illnesses are immigrants from Africa, Asia, and South America). The clinical spectrum of RTIs in travelers is broad, from upper respiratory tract infections (URTIs), pharyngitis, bronchitis, pneumonia to influenza-like illness. The spectrum of microbial agents causing RTIs include numerous viruses and bacteria, rarely fungi and parasites. Most cases of respiratory infections in travelers are URTIs, which are mild and therefore unreported. Traveling presents unique opportunities for close contact with other travelers, many of whom may harbor respiratory pathogens. Excellent examples are cruise ships and Hajj (pilgrimage), with their close environments, large number of passengers/pilgrims, and high risk of RTIs transmission. The pathogen typically affecting luxury tourism (cruise ships, hotels) is *Legionella*, whereas among Hajj pilgrims the most common reported respiratory pathogens are viruses. Respiratory symptoms are not rare among systemic febrile illnesses that are not commonly associated with the respiratory tract, e.g., one in three travelers with fever of unknown origin is diagnosed with malaria. Similarly, cough is not uncommon in enteric fever and leptospirosis, which can initially be mistaken for RTIs. Fever and cough with an acute onset are typical symptoms of influenza-like illness. An acute fever episode with cough can be also observed in geohelminths infections, fever and pneumonia in

Q fever. Travelers returning from the tropics who report to a health care facility with symptoms of infection need to undergo a thorough clinical examination. It is also necessary that a detailed history be taken from such patients, to determine the incubation period and risk factors, as that facilitates targeted diagnosis and further treatment.

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