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Morbidity of foreign travelers in Attica, Greece: a retrospective study

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Abstract Over the last decade, travel medicine was mainly focused on the epidemiology of diseases among travelers to developing countries. However, less is known about travel-related morbidity in Europe. We evaluated the demographic and clinical characteristics of foreign travelers to Greece during a 5-year period 01/01/2005 to 31/12/2009 who sought medical services from a network of physicians performing house-call visits (SOS Doctors) in the area of Attica, Greece. Overall, 3,414 foreign travelers [children (≤18 years of age): 27%] were identified; 151 (4.4%) required transfer to a hospital. The most common clinical entities were: respiratory disorders (34%), diarrheal disease (19%), musculoskeletal (12%), dermatologic (7%), non-diarrheal gastrointestinal (6%), and genitourinary (5%) disorders. Respiratory disorders were the most frequent diagnosis during all seasons, followed by diarrheal gastrointestinal and musculoskeletal disorders. Respiratory and dental conditions were observed significantly more frequently in children. Respiratory disorders were observed significantly more frequently during winter (47%) compared to spring (36.7%), summer (30.9%), and autumn (30.5%), ($p < 0.01$). Despite the limitations of the retrospective methodology, our findings suggest that mild, self-limited respiratory events may be the prevalent cause for seeking primary health care during travel to Greece. Our findings may be extrapolated to other countries with similar climatic and socioeconomic status.

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Introduction

Over the last decade, travel medicine was mainly focused on the epidemiology of diseases among travelers to resource-limited destinations [1]. In particular, it has been suggested that systemic febrile illness occurs disproportionally in sub-Saharan Africa and southeast Asia, dermatologic disorders in the Caribbean and South America, and acute diarrhea in south central Asia [2]. On the other hand, although Europe concentrates approximately 50% of international tourist arrivals [3], the current understanding of travel-related morbidity in the developed world is limited [4, 5]. In this context, EuroTravNet, the travel medicine collaborative network of the European Centre for Disease Prevention and Control (ECDC), is currently working on "Travel health country information for travel within EU/EFTA" in an attempt to illustrate travel health risks within Europe [6].

A member state of the European Union, Greece is ranked 16th place among the world's tourist destinations, receiving 16 million travelers annually [7]. Because of its location at the meeting point of three continents (Asia, Africa, and Europe), Greece is established as a famous touristic stopover, and,

thereby, could be a useful sentinel for the surveillance of travel-related morbidity.

This study is the first, to our knowledge, to describe the spectrum of disease among travelers in Attica, Greece, over a 5-year period.

Methods

Clinical setting

SOS Doctors is a network of physicians that provides out-patient services in the area of Attica (metropolitan area of Athens and surrounding cities), Greece. House-call visits are performed not only by general practitioners but by specialized doctors as well. The network of SOS Doctors occupies approximately 100 physicians of 21 different medical specialties. A coordinator doctor answers the phone call and obtains a brief medical history of the patient, so that the patient will be referred to a doctor with appropriate speciality. About 70% of visits are performed within an hour from the request. Doctors making the house calls are equipped with basic medications and an electrocardiogram machine. After examination, the physician fills in a standardized form the date of visit, hotel name, patient name, sex, age, cause of phone call, main symptoms, history, empirical diagnosis, need for hospitalization, and treatment [8, 9]. The diagnosis is at the discretion of the physician that performs the house call, based on the evaluation of the patient's medical history, the findings of the clinical examination, and epidemiological factors (if any).

Ethics considerations

The study was approved by the ethics committee of the SOS Doctors network. Due to the retrospective design of the study, written/oral informed consent from individual patients was not deemed necessary by the ethics committee of the SOS Doctors network.

Patient population

Eligible patients were foreign individuals who were accommodated at a hotel in Attica from 1/1/2005 through 31/12/2009 and who sought medical services from the network of SOS Doctors. Diagnosis was assigned by the treating physician at his/her own discretion, based on the patient's history and clinical manifestations, along with the epidemiological aspects.

Data collection

We retrospectively reviewed the electronic databases of the SOS Doctors network and retrieved data regarding eligible patients' demographic characteristics, types of comorbidity, season of visit, diagnosis assigned to the patients and recorded by the treating physician, as well as the need for hospital transfer.

Data analysis

Due to the fact that most of the diagnoses were not etiologic, individual diagnoses were categorized into 17 major system categories in order to facilitate the consistent classification of cases (see the supplementary material). Our primary objective was to describe the proportionate morbidity of foreign travelers in Attica, as well as the relative frequency of specific diagnoses within each clinical category. In addition, we analyzed the proportionate morbidity according to season, age, and gender. Seasons were meteorologically defined: winter (December 1 to February 28), spring (March 1 to May 31), summer (June 1 to August 31), and autumn (September 1 to November 30) [10]. The Chi-square or Fisher exact tests were used for the evaluated dichotomous variables. A p-value<0.01 was considered as indicative of statistical significance. The comparisons were performed with the use of the OpenEpi and SPSS software [11, 12].

Results

Patient characteristics

A total of 3,414 foreign travelers were identified during the study period. Of these, 2,483 (73%) were adults (>18 years of age). Data on sex was only available for 1,142 individuals, of whom 548 (48%) were females. Thirty-eight percent of travelers were evaluated during summer, while the remaining were evaluated during spring (26%), autumn (25%), and winter months (11%). Detailed data regarding the characteristics of the included patients is presented in Table 1.

Proportionate morbidity specified by the major syndrome category

Detailed data on the proportionate morbidity of the 3,414 included patients is presented in Table 2. Diagnoses for 71% of these patients were assigned to 4 of 17 syndrome categories. Specifically, these were respiratory disorders (34%), diarrheal (19%) or other gastrointestinal disease (6%), and injury or musculoskeletal disorders (12%). Dermatologic and genitourinary entities accounted for 7% and 5% of all evaluated patients, respectively. Neurologic, psychological, and cardiovascular disorders accounted for 3%, 2%, and 2.4% of the evaluated patients, respectively. Non-specific

Table 1 Characteristics of the 3,414 foreign travelers evaluated

Demographic characteristics	
Sex[a], n (%)	
Female	548 (48)
Age, years	
mean (±SD)	35 (±23)
Age group, n (%)	
0–5 years	553 (16)
6–18 years	378 (11)
19–40 years	1,027 (30)
41–60 years	952 (28)
>60 years	504 (15)
Season of visit, n (%)	
Summer	1,281 (38)
Autumn	852 (25)
Winter	379 (11)
Spring	902 (26)
Comorbidity, n (%)	
None	3,227 (95)
Cardiovascular	82 (2.4)
Diabetes	24 (0.7)
Asthma, COPD	24 (0.7)
Gastrointestinal	21 (0.6)

COPD chronic obstructive pulmonary disease

[a] Data on sex was available for a subset of 1,142 (34%) of patients

Table 2 Proportionate morbidity by clinical category and frequency of selected diagnoses within each clinical category regarding the 3,414 foreign patients evaluated

	n (%)
Respiratory [n=1,165 (34%)]	
Upper respiratory tract infection[a]	756 (65)
Otitis[b]	121 (10)
Lower respiratory tract infection[c]	102 (9)
Diarrheal GI [n=643 (19%)]	
Non-diarrheal GI [(n=192 (6%)]	
Gastritis	62 (32)
Abdominal pain (under evaluation)	44 (23)
Acute abdomen	12 (6)
Musculoskeletal [n=409 (12%)]	
Injury	151 (37)
Sciatica/low back pain	87 (21)
Skin trauma	34 (8)
Dermatologic [n=224 (7%)]	
Dermatitis/eczema	43 (19)
Insect bite	32 (14)
Urticaria/allergic rash	23 (10)
Genitourinary [(n=184 (5%)]	
Cystitis	101 (55)
Kidney stone	37 (20)
Neurologic [n=113 (3%)]	
Vertigo	84 (74)
Migraine	18 (16)
Psychologic disorders [67 (2%)]	
Ophthalmologic [n=71 (2%)]	
Conjunctivitis	30 (42)
Keratitis	22 (31)
Cardiovascular [n=82 (2.4%)]	
Hypertension	27 (33)
Arrhythmias	16 (20)
Non-specific symptoms [n=142 (4.2%)]	
Fever	42 (30)
Headache	22 (15)
Syncope	20 (15)
Chest pain	12 (8)
Gynecology and obstetrics disorders [14 (0.4%)]	
Systemic febrile illness [32 (0.9%)]	
Chronic disease [18 (0.5%)]	
Dental problems [39 (1.1%)]	
Drug-related adverse events [7 (0.2%)]	
Healthy [12 (0.4%)]	

[a] Including: upper respiratory infection (281), common cold (150), sinusitis (83), tonsillitis (97), pharyngitis (87), rhinitis (22), laryngitis (24), epiglottitis (1), pharyngotracheitis (6), and nasopharyngitis (5)

[b] Including: otitis media (76), otitis serous (22), and otitis externa (23)

[c] Including: unspecified lower respiratory tract infection (75), pneumonia (11), and bronchiolitis (16)

symptoms and findings, including fever, weakness, chest pain, and syncope, were reported in 4% of all patients.

One hundred and fifty-one (4.4%) patients were deemed to require transfer to a hospital. The most common reasons included possible acute abdominal disorder (acute abdominal pain, iliac fossa pain/appendicitis, right hypochondrial pain/cholecystitis, pancreatitis) (30/151 [20%]), respiratory illness (20/151 [13%]), gastroenteritis (15/151 [10%]), musculoskeletal (15/151 [10%]), cardiologic (14/151 [9%]), genitourinary (10/151 [7%]), and neurologic disorders (9/151 [6%]).

Relative frequencies of specific diagnoses within each clinical category

Of the respiratory disorders, upper respiratory tract infection was the most common diagnosis (65%), followed by otitis (10%) and lower respiratory tract infection (9%). All cases (n=643) of diarrheal disease were characterized as either gastroenteritis (97%) or food poisoning (3%). Of the non-diarrheal gastrointestinal disorders, gastritis accounted for 32% of cases, whereas acute abdomen was responsible for another 6% of cases.

Injury and low back pain/sciatica accounted for 37% and 21% of musculoskeletal complaints, respectively. The most common diagnoses among patients with dermatologic disorders were dermatitis/eczema (19%) or insect bites (14%).

Cystitis was the major cause of genitourinary disorders. Vertigo accounted for 74% of neurologic disorders. Regarding systemic febrile illness, there were 12 cases of abscess, nine cases of unspecified viral skin rash, eight cases of varicella infection (chickenpox), and one case each of measles, mumps, and rubella. Detailed data is presented in Table 2.

Proportionate morbidity according to season of visit, age, and sex

Detailed data regarding the distribution of morbidity according to the season of visit, age, and sex of the evaluated patients is presented in Table 3. Respiratory tract disorders were consistently more frequent among the evaluated patients during all seasons, followed by diarrheal gastrointestinal and musculoskeletal disorders. Statistically significant differences between different seasons were observed in the frequency of two of the evaluated clinical entities (respiratory diseases and dermatologic disorders). Specifically, respiratory diseases were observed significantly more frequently ($p < 0.01$) during winter (47%) compared to spring, summer, and autumn (36.7% vs. 30.9% vs. 30.5%, respectively).

Taking into consideration that the recent H1N1 influenza pandemic occurred in the late stages of our study period, we performed an exploratory analysis excluding the patients evaluated during the year 2009. For the remaining years 2005–2008, respiratory diseases also constituted the majority among the evaluated diseases in all seasons. Moreover, respiratory diseases were observed significantly more frequently ($p < 0.01$) during winter (47.7%) compared to spring, summer, and autumn (35.1% vs. 30.3% vs. 28.2%, respectively). Dermatological disorders were observed significantly more frequently during autumn (8.3%) and summer (7.9%) compared to winter and spring (4.9% vs. 2.1%, respectively).

Respiratory conditions were significantly more common among pediatric compared to adult patients (43.6% vs. 30.6%, $p < 0.01$), as were dental problems (1.9% vs. 0.8%, $p < 0.01$). Injury/musculoskeletal disorders, genitourinary, cardiovascular, and psychological disorders were observed significantly more frequently among adults. No difference was observed between male and female patients regarding any of the evaluated diagnoses.

Discussion

According to our findings, the most common health problem among travelers to Attica was respiratory disorders, followed subsequently by gastrointestinal and musculoskeletal disorders. This morbidity profile seems to differ from that seen among travelers to developing countries, where gastrointestinal disease is the dominant cause of illness (~40%), followed by systemic febrile illness [2]. This difference possibly reflects the poor hygiene and unsecure water supply [13], as well as the endemicity of mosquito-borne diseases (e.g., malaria, dengue) in developing countries [14].

A recent study, which provided data on the morbidity of travelers presenting to EuroTravNet clinics after travel to Europe, showed that gastrointestinal disease accounted for 17%, respiratory illness for 14%, and dermatologic conditions for 8% of the overall health events [4]. This morbidity profile seems to be in accordance with our findings, with the exception of respiratory disorders, which were observed more frequently in our study. Many factors may account for this difference. Firstly, the EuroTravNet study focused on the description of illness after travel, when respiratory disorders that are usually mild and self-limited are expected to have resolved. Another factor that may account for this difference is that travelers are more likely to visit a travel clinic for a traditionally travel-associated health problem, such as "traveler's diarrhea". Moreover, the exclusion of the year 2009 in order to assess the potential impact of the recent H1N1 influenza pandemic did not seem to affect our findings regarding the preponderance of respiratory disorders among all the other evaluated clinical entities.

The observation that respiratory disease is common among visitors to some European countries has been reported by previous studies as well. Specifically, an analysis of data on 17,228 travelers presenting to GeoSentinel clinics from 1997 through 2007 suggested that respiratory syndromes were more frequently reported in travelers returning from eastern Europe (compared to other travel regions) [5]. Similar findings were reported by a pediatric study, which suggested that travel to Europe or North America was associated with presentation with a respiratory disorder [15].

In our study, seasonal variations in the proportionate morbidity of travelers to Athens were observed for respiratory and dermatologic conditions. The observation that respiratory disease was more frequently observed during winter is not surprising. Previous studies have shown that low temperatures are associated with increased risk for respiratory tract infections, by either changing the probability of pathogen transmission or suppressing the host's immune responses [16]. Moreover, a potential effect of specific meteorological variables on the incidence of respiratory, urinary tract infections, and infectious diarrhea has been suggested in some studies [17–20]. Seasonality in skin disease has also been described. Specifically, it was attributed to variations in temperature, humidity, ultraviolet radiation, and environmental allergen circulation [21]. Notably, the proportionate morbidity caused by diarrheal disease was similar between the evaluated seasons (18–20%). Even

Table 3 Proportionate morbidity according to season, age, and sex regarding the 3,414 foreign travelers evaluated

	Season				p-value	Age		p-value	Sex[a]		p-value
	Winter $n=379$	Spring $n=902$	Summer $n=1,281$	Autumn $n=852$		≤18 years $n=931$	>18 years $n=2,483$		Male $n=594$	Female $n=548$	
Respiratory	178 47%	331 36.7%	396 30.9%	260 30.5%	**<0.01**	406 43.6%	759 30.6%	**<0.01**	215 36.2%	182 33.2%	0.29
Diarrheal gastrointestinal	76 20.1%	176 19.5%	238 18.6%	153 18%	0.77	177 19%	466 18.8%	0.87	95 16%	107 19.5%	0.12
Non-diarrheal gastrointestinal	19 5%	48 5.3%	74 5.8%	51 6%	0.88	46 4.9%	146 5.9%	0.29	33 5.6%	29 5.3%	0.84
Injury and musculoskeletal	31 8.2%	99 11%	159 12.4%	120 14.1%	0.02	82 8.8%	327 13.2%	**<0.01**	71 12%	57 10.4%	0.41
Dermatologic	8 2.1%	44 4.9%	101 7.9%	71 8.3%	**<0.01**	54 5.8%	170 6.8%	0.27	43 7.2%	39 7.1%	0.94
Genitourinary	14 3.7%	44 4.9%	72 5.6%	54 6.3%	0.24	32 3.4%	152 6.1%	**<0.01**	32 5.4%	32 5.8%	0.74
Neurologic	9 2.4%	27 3%	53 4.1%	24 2.8%	0.19	26 2.8%	87 3.5%	0.30	16 2.7%	22 4%	0.21
Psychologic	6 1.6%	24 2.7%	23 1.8%	14 1.6%	0.36	9 1%	58 2.3%	**<0.01**	6 1%	13 2.4%	0.07
Ophthalmologic	5 1.3%	18 2%	34 2.7%	14 1.6%	0.26	19 2%	52 2.1%	0.92	12 2%	7 1.3%	0.33
Cardiovascular	9 2.4%	20 2.2%	32 2.5%	21 2.5%	0.99	9 1%	73 2.9%	**<0.01**	14 2.4%	18 3.3%	0.34
Gynecology and obstetrics	2 0.5%	2 0.2%	9 0.7%	1 0.1%	0.15	4 0.4%	10 0.4%	0.91	0 0%	5 0.9%	NA
Systemic febrile illness	1 0.3%	11 1.2%	16 1.2%	4 0.5%	0.11	10 1.1%	22 0.9%	0.61	5 0.8%	5 0.9%	0.90
Chronic disease	2 0.5%	6 0.7%	4 0.3%	6 0.7%	0.58	1 0.1%	17 0.7%	0.02	8 1.3%	1 0.2%	0.05
Dental issues	1 0.3%	13 1.4%	13 1%	12 1.4%	0.26	18 1.9%	21 0.8%	**<0.01**	9 1.5%	12 2.2%	0.40
Drug-related adverse events	2 0.5%	1 0.1%	2 0.2%	2 0.2%	0.47	1 0.1%	6 0.2%	0.78	4 0.7%	1 0.2%	0.43
Healthy	1 0.3%	4 0.4%	6 0.5%	1 0.1%	0.55	2 0.2%	10 0.4%	0.65	2 0.3%	1 0.2%	>0.99
Non-specific signs or findings	15 4%	34 3.8%	49 3.8%	44 5.2%	0.41	35 3.8%	107 4.3%	0.47	29 4.9%	17 3.1%	0.13

NA not applicable

[a] The data refer to the subset of patients with available data regarding sex ($n=1,142$)

though rotavirus gastroenteritis in pediatric patients occurs mainly during winter and spring months, other non-infectious factors, including food poisoning, may contribute to an increase of diarrheal disease during summer months.

Pretravel advice according to the travel destination constitutes a challenge for travel medicine. Our findings suggest that visitors to Attica may require a consultation towards the prevention of respiratory disease. The avoidance of poorly ventilated places is of great importance [22]. Overcrowding, which may facilitate the spread of respiratory disease, is a common situation in many places in Athens, during both winter and summer. The administration of influenza and pneumococcal vaccine should also be recommended for travelers who are at risk for complications [23]. Regarding diarrheal disorders, travelers should be informed that high-risk foods include salads, unpasteurized dairy products, creamy dressings, mussels, and shrimps [24].

Our study has limitations that need to be considered in the interpretation of the findings. As in any retrospective study, the data were not collected and recorded under the guidance of a specific research protocol. Therefore, the results depend on the accuracy and the availability of the medical charts. Additionally, the retrospective design did not allow us to have additional information regarding the

reason for travel (tourism, business, education, visiting friends and relatives) and country of origin. SOS Doctors is a network of physicians that provides outpatient medical services. In this regard, mild and self-limited disease is overrepresented. Additionally, mostly acute health events are included in our study; therefore, diseases with long incubation periods, which are mainly observed among returned travelers, may have been underrepresented.

In conclusion, respiratory disease was the major cause of illness among travelers during their stay in Attica, Greece, during a five-year period. Our findings suggest that the morbidity of individuals seeking primary health care during travel seems to differ from that of returned travelers presenting to travel clinics. Traveler's diarrhea should not be the only health problem that a traveler should be concerned of. Self-limited acute respiratory events may be an important cause for seeking primary care during travel in developed countries.

References

1. Rack J, Wichmann O, Kamara B et al (2005) Risk and spectrum of diseases in travelers to popular tourist destinations. J Travel Med 12:248–253
2. Freedman DO, Weld LH, Kozarsky PE et al (2006) Spectrum of disease and relation to place of exposure among ill returned travelers. N Engl J Med 354:119–130
3. World Tourism Organization. International Tourism 2010: Multispeed recovery. Available online at: http://85.62.13.114/media/news/en/press_det.php?id=7331&idioma=E. Accessed 6 Dec 2011
4. Field V, Gautret P, Schlagenhauf P et al (2010) Travel and migration associated infectious diseases morbidity in Europe, 2008. BMC Infect Dis 10:330
5. Gautret P, Schlagenhauf P, Gaudart J et al (2009) Multicenter EuroTravNet/GeoSentinel study of travel-related infectious diseases in Europe. Emerg Infect Dis 15:1783–1790
6. EuroTravNet. European Travel and Tropical Medicine Network of the International Society of Travel Medicine. Travel risks, precautions and vaccination requirements. Available online at: http://www.istm.org/eurotravnet/requirements.html. Accessed 6 Dec 2011
7. World Tourism Organization. UNWTO World Tourism Barometer. Available online at: http://www.unwto.org/facts/eng/pdf/barometer/UNWTO_Barom10_1_en.pdf. Accessed 6 Dec 2011
8. Peppas G, Theocharis G, Karveli EA et al (2006) An analysis of patient house calls in the area of Attica, Greece. BMC Health Serv Res 6:112
9. SOS Doctors. Home page at: http://www.sosiatroi.gr/en. Accessed 6 Dec 2011
10. Trenberth KE (1983) What are the seasons? Bull Am Meteor Soc 64:1276–1282
11. Dean AK, Sullivan KM, Soe MM. OpenEpi: Open Source Epidemiologic Statistics for Public Health, Version 2.2.1. Updated 2008/04/06 [cited 2008/09/18]. Available online at: http://www.OpenEpi.com
12. SPSS for Windows, Rel. 17.0.0 (23 Aug 2008). Chicago: SPSS Inc.
13. Herwaldt BL, de Arroyave KR, Roberts JM et al (2000) A multi-year prospective study of the risk factors for and incidence of diarrheal illness in a cohort of Peace Corps volunteers in Guatemala. Ann Intern Med 132:982–988
14. Mirzaian E, Durham MJ, Hess K et al (2010) Mosquito-borne illnesses in travelers: a review of risk and prevention. Pharmacotherapy 30:1031–1043
15. Hagmann S, Neugebauer R, Schwartz E et al (2010) Illness in children after international travel: analysis from the GeoSentinel Surveillance Network. Pediatrics 125:e1072–e1080
16. Mourtzoukou EG, Falagas ME (2007) Exposure to cold and respiratory tract infections. Int J Tuberc Lung Dis 11:938–943
17. Falagas ME, Theocharis G, Spanos A et al (2008) Effect of meteorological variables on the incidence of respiratory tract infections. Respir Med 102:733–737
18. Falagas ME, Peppas G, Matthaiou DK et al (2009) Effect of meteorological variables on the incidence of lower urinary tract infections. Eur J Clin Microbiol Infect Dis 28:709–712
19. Levy K, Hubbard AE, Eisenberg JN (2009) Seasonality of rotavirus disease in the tropics: a systematic review and meta-analysis. Int J Epidemiol 38:1487–1496
20. Lopman B, Armstrong B, Atchison C et al (2009) Host, weather and virological factors drive norovirus epidemiology: time-series analysis of laboratory surveillance data in England and Wales. PLoS One 4(8):e6671
21. Hancox JG, Sheridan SC, Feldman SR et al (2004) Seasonal variation of dermatologic disease in the USA: a study of office visits from 1990 to 1998. Int J Dermatol 43:6–11
22. Jefferson T, Del Mar C, Dooley L et al (2010) Physical interventions to interrupt or reduce the spread of respiratory viruses. Cochrane Database Syst Rev 20:CD006207
23. [No authors listed] (1997) Influenza vaccination for travellers. CMAJ 156:677–678
24. von Sonnenburg F, Tornieporth N, Waiyaki P et al (2000) Risk and aetiology of diarrhoea at various tourist destinations. Lancet 356:133–134