Infectious Diseases Now 51 (2021) 279–284

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Elsevier Masson France EM|consulte www.em-consulte.com

Original article

Travellers' risk behaviors and health problems: Post-travel follow up in two travel medicine centers in Italy☆

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INFO ARTICLE

Historique de l'article :
Reçu le 12 février 2020
Reçu sous la forme révisée le 15 avril 2020
Accepté le 8 octobre 2020
Disponible sur Internet le 15 October 2020

Keywords :
Dangerous behavior
Travel-associated infectious diseases
Travel medicine
Travel-related health problems
Travel-related illness

ABSTRACT

Objectives. – We examined the association between travellers' characteristics, compliance with pre-travel recommendations and health problems.
Methods. – Volunteer travellers were enrolled and data collected using a questionnaire between 30–60 days after returning home. We analyzed the associations through bivariate and multivariate models.
Results. – Of the 468 enrolled travelers, 68% consumed raw food and 81% food containing milk and/or eggs. 32% consumed street vendor food and 30% drinks containing ice. 24% used the recommended mechanical prophylaxis measures. 46% got sick during and/or after travel (gastrointestinal symptoms most frequently). Factors predisposing to health problems were female gender, youth/middle age, intermediate travel duration and profession. The American continent and staying in hostels and tents were significantly associated with febrile illness. Street vendor food was significantly associated with skin reactions.
Conclusions. – Adherence to behavioral recommendations remains low. Travellers must be informed of health risks during and after travel.
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1. Introduction

1.1. Background

Between 1950 and 2017 the world population increased 2.9 fold while the number of travellers increased 53 fold [1,2]. In 2017, the largest number of international travellers were from Europe (51%), followed by Asia and the Pacific (25%), the Americas (16%), Africa (5%) and the Middle East (4%) [2]. Travel can expose one to health risks due to infectious diseases, changes in altitude, climate, humidity and temperature as well as accidents. The risk of health problems during international travel depends on different factors such as the destination, the age and health of the traveller, the duration of the trip and planned activities [3]. Traveller's diarrhea is the most frequent illness reported [4]. According to the GeoSentinel, in the five-year period between 2007 and 2011 most travellers acquired the disorder in Asia (32.6%), followed by sub-Saharan Africa (26.7%) and Latin America and the Caribbean (19.2%). Among the main reasons for travel, 55.7% of subjects reporting symptoms traveled for tourism, 13.6% for work and 15.5% were Visiting Friends and Relatives (VFR). The most frequently reported diseases were gastrointestinal infections (34%), febrile illness (23.3%) and dermatological diseases (19.5%). Only 40.5% of travellers reporting symptoms pointed to a pre-travel consultation by a health professional [5]. Pre-travel consultation is an important tool to make travellers aware of health risks they may incur and the ways to avoid illness. The consultation should preferably take place about six weeks before travel in time to receive the recommended vaccinations and chemoprophylaxis indications [6]. There are still a limited number of studies in which traveller behavior and health problems during and after travel are assessed. Similarly, there are few studies analyzing which risk factors are most associated with health disorders.

☆ Dr A. Stefanati will handle correspondence concerning this article, press proofs, and orders for off-prints. The study described in the manuscript was previously reported as abstract at 51 SITI National Congress of Riva del Garda 17–20 October 2018 (Valutazione dello stato di salute nei soggetti al rientro da un viaggio internazionale nell'azienda USL di Ferrara. Assessment of the state of health in subjects returning from an international trip to the Ferrara Local Health Authority. G. Gabutti, L. Bertoni, V. Baccello, F. Brosio, A. Formaglio, A. Stefanati). This research did not receive any grant from funding agencies in the public, commercial, or not for-profit sectors.
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https://doi.org/10.1016/j.medmal.2020.10.009
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1.2. Objective

The objective of this study was to follow-up international travellers attending pre-travel health consultation services in two Italian centers in Northern Italy. We evaluated compliance to prophylactic measures and behavioral advice given during pre-travel consultation, to describe the types and frequencies of health problems occurring during and after travel. Finally, we assessed possible associations between risk factors and travel-related health problems.

2. Material and methods

2.1. Study design

The study is a descriptive observational study conducted in two centers in Northern Italy: AULSS 7 Pedemontana in Veneto Region and AUSL of Ferrara in Emilia-Romagna Region. International travellers aged ≥ 14 years were enrolled in travel clinics in the period between 01 January, 2017 and 31 January, 2018. The only exclusion criterion was the lack of ability to fully understand the study procedures and thus express consent to participate. The travelers received pre-travel advice although consultations mainly concerned tropical or intertropical countries. Data was collected through a post-travel questionnaire administered through telephone interviews in a period between 30 and 60 days after their return. Questionnaires were sent by e-mail after 5 unsuccessful phone contact attempts. Written consent was obtained from all participants and Ethics Committee approvals were obtained for both travel clinics. The questionnaire was based on the available literature [7]. It consisted of 40 questions mostly in multiple-choice form, divided into three sections: demographic and travel characteristics, compliance with advice given during the pre-travel consultation, health problems during and after travel including necessary medical evaluations after the trip. The assessment of compliance with protection measures against vector-borne diseases was administered only to travellers visiting high-risk areas according to the Center for Disease Control and Prevention (CDC) and the Scottish and British Travel Health consultation sites [8–10]. Diarrhea was defined according to WHO criteria [11].

2.2. Statistical methods

Collected data was processed for descriptive analysis through Microsoft Excel®, 365. The univariate model was used to process answers provided by international travellers. Finally, we assessed the association between health problems and traveller characteristics (gender, age and profession), some travel characteristics (destination, duration of travel and type of accommodation) as well as some behavioral risks. Bivariate and multivariate models were used. For the bivariate model, the *P*-value of the Pearson Chi-square test and Fisher's exact test < 0.05 was considered statistically significant. The Yates correction for the Pearson Chi-square test was used when needed. When bivariate *P*-values were less than 0.10, a multivariate logistic regression model was used, and adjusted odds ratios and 95% confidence intervals were calculated. Statistical analyzes were carried out with the SPSS Statistics Program (Version 24, IBM Corp., USA).

3. Results

3.1. Sample description

579 international travellers were enrolled from the two Travel Medicine Centers. Of these, a total of 468 travellers (80.8%) were admitted to the study after the telephone questionnaire: 61.5% from Travel Center in Veneto Region and the others from Travel Center in Emilia-Romagna Region. 27 travellers canceled or postponed the trip, 77 were not available after the 5 predetermined telephone attempts and subsequent e-mail notice. 5 travellers were excluded because of the lack of demographic data and 2 were excluded because their travel destination was within Europe, with a risk comparable to Italy.

Demographic features, destinations and travel information are presented in Table 1. 65.8% of all travellers preferred hotels but only 42.5% chose hotels as the only type of accommodation for the entire duration of the trip. 9.6% chose B&B or guest houses as the only type of accommodation, 10.7% stayed exclusively in a private home, 2.1% in a hostel and 1.7% in a tent.

3.2. Chemoprophylaxis and vaccination

50% of travellers went to malaria endemic areas and were advised to take chemoprophylaxis. Of those, 67% went to Africa, 23% to Asia and 10% to America. Only 56% of travellers actually took chemoprophylaxis. Most of them (58%) took atovaquone/proguanil, 37% mefloquine and 5% doxycycline. 96% of travellers went to at-risk areas for vector-borne diseases. Only 24% of them followed all recommended mechanical prophylaxis measures to protect against insect bites (insect repellents, light and covering clothes, mosquito nets on the windows or above the bed).

Vaccines against typhoid fever and hepatitis-A were the most recommended vaccinations (84% and 71% of all international travellers respectively), but only 70% of travellers decided to get a typhoid fever vaccination and 61% took the hepatitis-A vaccination. TBE vaccine is among the most recommended vaccination for travelers but was not considered because the population of travelers who choose Europe as their destination has been excluded.

Similarly, for other vaccinations, the percentage of travellers who decided to be vaccinated was lower than the percentage of travellers who were advised to be vaccinated.

3.3. Compliance to behavioral advice

68% of international travellers consumed raw food at least once during their trip. In particular, 55% consumed raw vegetables, 36% fruit not personally peeled, 12% uncooked fish and 4% uncooked meat. Most travellers consumed raw/uncooked food in Asia. Uncooked meat/fish was eaten more frequently by young travellers (16–30 years) than middle-aged (31–50 years) and older travellers (≥51 years). The percentage of travellers who consumed food containing milk and/or eggs was 81%. In particular, 64% of travellers consumed eggs, 32% cream, 23% fresh and soft cheeses and 22% mayonnaise and/or sauces. 32% of travellers consumed street vendor food, mostly in Asia. 30% of travellers consumed drinks containing ice, most frequently in Asia. 32% of travellers reported that they always washed their hands before meals and 47% always brushed their teeth with bottled water. Regarding their profession, 100% of travellers working in a restaurant or in the catering field always washed their hands before meals. Hands were washed before meals and teeth brushed with bottled water most frequently by travellers in Asia.

3.4. Health problems

Health problems during travel were reported by 39% of international travellers. The most frequent reported health problems were gastrointestinal (75% of travellers with health problems during travel), followed by dermatological problems (15%) and febrile diseases (14%). In particular, 22% of all international travellers had diarrhea during travel. Health problems after travel were reported by 19% of international travellers. As during travel, the most

Table 1
Demographics, destinations and travel's information of international travellers (n = 468). Data are given as numbers of cases and their percentage.

	n (%)		n (%)
Sex		Geographic regions	
Male	244 (52)	South-Eastern Asia	107 (23)
Female	224 (48)	Southern Asia	75 (16)
Age classes (years)		Eastern Africa	73 (16)
16–30	173 (37)	Western Africa	44 (9)
31–50	177 (38)	Southern America	40 (9)
Over 50	118 (25)	Southern Africa	32 (7)
Nationality		Insular Africa	22 (5)
Italian	428 (91)	Eastern Asia	20 (4)
Others	40 (9)	Northern America	11 (2)
Foreign nationality[a]		Caribbean	10 (2)
African	23 (58)	Western Asia	10 (2)
European (other than Italian)	11 (28)	Other single regions	12 (3)
North American	2 (5)	Multiple regions	12 (3)
South American	3 (8)	Duration of travel (days)	
Asian	1 (3)	1–14	161 (34)
Educational level		15–29	220 (47)
None	2 (0)	≥ 30	87 (19)
Primary school	6 (1)	Type of travel	
Secondary school	45 (10)	Static	121 (26)
High school	204 (44)	Itinerant	347 (74)
University	211 (45)	Purpose of travel	
Underlying diseases		Tourism	292 (62)
Atopy and/or allergy	59 (12)	Business	69 (15)
Hypothyroidism	15 (3)	Study	14 (3)
Cardiovascular disease	13 (3)	VFR	29 (6)
Other disease and conditions	35 (7)	Volunteering	49 (10)
None	357 (76)	Other	15 (3)
Profession			
Restaurant and catering field	10 (2)		
Health workers	42 (9)		
Others	415 (89)		
Destination of travel			
Africa	182 (39)		
America	67 (14)		
Asia	219 (47)		

[a] Percentage calculated on the total of not Italian travellers (n = 40).

reported health problems after travel were gastrointestinal (68% of travellers with health problems after travel), followed by febrile diseases (16%). Demographics, destinations and travel information of international travellers with health problems during and after travel are presented in Table 2. 37% of travellers with health problems after travel experienced the illness the day of return and 46% within the first 7 days. In the remaining 17% of travellers, the disorders occurred between 15 and 30 days. 6% of travellers saw a doctor when they come back from their trip and 8% took medication. Most of them took antibiotics (37%). Altogether 46% of travellers presented health problems during and/or after travel. Most of them were females (54%), young travellers (16–30 years, 49%), went to Asia (51%), for a medium-length trip (15–29 days, 53%) and for tourism reasons (63%). The most reported health problems were gastrointestinal (75% of all travellers with health problems). Fig. 1 summarizes demographics of participants, travel information and travellers' health problems divided according to travel destination.

Table 2
Demographics, destinations and travels' information of international travellers with health problems during and after travel. Data are given as numbers of cases and their percentage of travellers with health problems during (n = 184) and after travel (n = 87).

	Reported experiencing health problem during travel, n (%)	Reported experiencing health problem after travel, n (%)
Sex		
Male	86 (47)	37 (43)
Female	98 (53)	50 (57)
Age classes (years)		
16–30	93 (51)	40 (46)
31–50	68 (37)	34 (39)
≥ 51	23 (12)	13 (15)
Profession		
Restaurant and catering field	4 (2)	1 (1)
Health workers	12 (7)	7 (8)
Other jobs	168 (91)	79 (91)
Destination of travel		
Africa	64 (35)	30 (35)
America	28 (15)	7 (8)
Asia	92 (50)	50 (57)
Duration of travel (days)		
1–14	42 (23)	23 (26)
15–29	98 (53)	47 (54)
≥ 30	44 (24)	17 (20)

3.5. Risk factors

As reported in Table 3 the risk factors for total health problems (during and/or after travel) were female gender (OR = 1.62; IC95% 1.08–2.44), youth (16–30 years; OR = 4.00; IC95% 2.29–7.00) and intermediate age (31–50 years; OR = 2.77; IC95% 1.61–4.78), intermediate travel duration (15–29 days; OR = 2.00 IC95% 1.24–3,21) and profession other than health workers and those in the catering field (OR = 2.49; IC95% 1.21–5.09). Only youth (16-30 years; OR = 5.39; IC95% 2.88–10.08) and intermediate age (31–50 years; OR = 2.54; IC95% 1.35–4.75) and the intermediate travel duration (15–29 days; OR = 1.79 IC95% 1.08–2.96) were risk factors for total gastrointestinal problems during and/or after travel. The risk factors for total febrile diseases (during and/or after travel) were intermediate travel duration (15–29 days; OR = 4.48; IC95% 1.60–14.67), American continent as a destination (OR = 2.83;

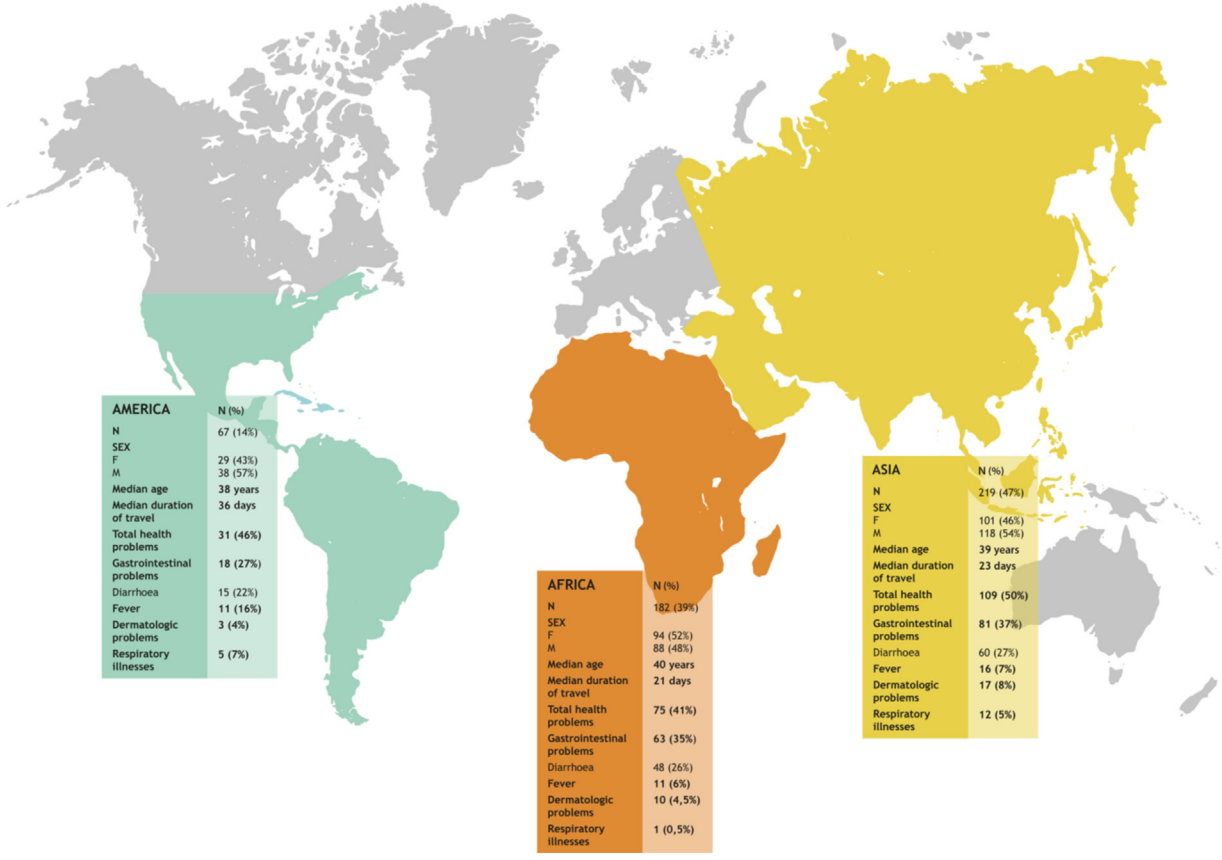

Fig. 1. Travellers' characteristics, travel and health problems during and/or after travel, according to the continent of destination.

Table 3
Risk factors of total health problems (during and/or after travel).

Total health problems	*P*	OR	95% CI
Sex			
Female	0.02	1.62	(1.08–2.44)
Male (ref)[a]	–	–	–
Age classes (years)			
16–30	0.00	4.00	(2.29–7.00)
31–50	0.00	2.77	(1.61–4.78)
≥ 51 (ref)[a]	–	–	–
Duration of travel (days)			
1–14 (ref)[a]	–	–	–
15–29	0.00	2.00	(1.24–3.21)
≥ 30	0.06	1.86	(0.97–3.55)
Profession[b]			
Other	0.01	2.49	(1.21–5.09)
Restaurant and catering field	0.79	1.22	(0.27–5.48)
Health workers (ref)[a]	–	–	–
Accommodation (ref = no)[a]			
Hotel	0.77	0.93	(0.58–1.50)
B&B	0.42	1.23	(0.74–2.05)
Hostel	0.54	1.23	(0.64–2.38)
Food (ref = no)[a]			
Fruit peeled not personally	0.19	1.34	(0.87–2.05)
Raw vegetables	0.45	1.17	(0.78–1.77)
Food from street vendors	0.64	1.12	(0.70–1.78)

[a] Reference category in multivariable logistic regression model.
[b] Inserted in multivariable logistic regression because its statistically significant association with sex ($P < 0.000$).

IC95% 1.06–7.57), accommodation in hostels (OR = 2.55; IC95% 1.02–6.36) and in a tent (OR = 3.47; IC95% 1.27–9.48). The longer travel duration (over 30 days; OR = 15.49; IC95% 1.64–146.48), Asian (OR = 9.90; IC95% 1.16–84.69) and American continent as destination (OR = 12.45; IC95% 1.36–113.86) were risk factors for total respiratory problems during and/or after travel. Finally, only youth (16–30 years; OR = 5.37; IC95% 1.15–25.06) and street vendor food (OR = 2.99; IC95% 1.32–6.80) were risk factors for total dermatological problems.

4. Discussion

4.1. Compliance to behavioral advice

Due to the continuous increase of international travel, a qualified pre-travel consultation is essential. However, adherence to the recommendations remains low. This situation is in line with other study results. In a previous Italian study, one third of travellers consumed food and at-risk drinks [7]. In a German study, 80% of travellers did not follow the traditional food recommendations [12]. In our study, the consumption of at-risk food occurred mostly in young people going to Asia. The same situation was described in an Israeli study: adherence to food recommendations is much more respected in elderly travellers (over 60 years) than in young people (20–30 years) [13]. Even in a Finnish study, elderly travellers paid more attention to behavioral recommendations, compared to young people traveling to Asia [14].

4.2. Health problems

Almost 40% of our travellers presented a health problem during their trip. This percentage is clearly lower than previous international studies: 76% of Finnish travellers, 64% of American travellers, 64% of British travellers, 70% of Israeli travellers [14–17]. Instead, this is similar to the percentage in other international studies: 43% in Germany, 38% in Switzerland and 49% in Sweden [18–20]. The percentage is higher only if compared with two recent American

studies [21,22]. However, Balaban's study was carried out with public health professionals, who probably were better prepared in terms of behavioral risks. In line with all the studies mentioned above, also in our study, the most frequently reported health problem during travel was diarrhea.

Almost a fifth of the travellers in our study (19%) presented health problems upon their return. This percentage is lower than reported in Hill's (26%) and Vilkman's study (32%) [14,23]. As in Hill's study, diarrhea was the most frequent health problem in our study. In Vilkmann's study fever was the most frequent illness after travel.

4.3. Risk factors

Gender, age, duration of travel and profession are risk factors for health problems during and/or after travel. In particular, similarly to the Finnish study, female gender (OR = 1.62; IC95% 1.08–2.44) was a factor predisposing to health problems [14]. Youth (16–30 years; OR = 4; IC95% 2.29–7) was a risk factor, as in previous studies [12,13,23]. In our study, as in the Finnish one, adults (31–50 years; OR = 2.77; IC95% 1.61–4.78) were found to be at greater risk than > 50 years subjects [14]. Age and duration of travel were the only risk factors for gastrointestinal problems during and/or after the trip. Young people (16–30 years; OR = 5.39; IC95% 2.88–10.08) and adults (31–50 years; OR = 2.54; IC95% 1.35–4.75) were more at risk of developing gastrointestinal problems, but no specific foods resulted as a risk factor. This could be due to the fact that during travel young people and <50-year-old adults have a lifestyle more similar to that of the local population and greater interaction with them. The intermediate duration of travel (15–29 days; OR = 1.79; IC95% 1.08–2.96) was found to be a risk factor. When on short trips, travellers are probably more compliant with the recommendations given during the pre-travel consultation, while after two weeks of travel, there is a progressive decrease in compliance with recommendations and travellers engage in more dangerous behaviors.

The intermediate duration of travel (15–29 days; OR = 4.84; IC95% 1.60–14.67), the American continent as destination (OR = 2.83; IC95% 1.06–7.57) and accommodation in hostels (OR = 2.55; IC95% 1.02–6.36) and a tent (OR = 3.47; IC95% 1.27–9.48) were risk factors for fever during and/or after travel. This differs from previous studies, in which fever is the most frequent disorder in travellers heading to Sub-Saharan Africa and South East Asia [24,25]. Our travellers probably had greater exposure to fever-causing agents in America. The fact that even the type of accommodation (hostel and tent) is a risk factor, suggests that travellers were possibly more exposed to vector-borne diseases in America.

The duration of travel over 30 days (OR = 15.49; IC95% 1.64–146.48), the American continent (OR = 12.45; IC95% 1.36–113.86) and the Asian one as destination (OR = 9.90; IC95% 1.16-84.69) were risk factors for respiratory problems during and/or after travel. This result was also reported in a Scottish study [26]. One hypothesis to explain this could be the greater exposure to air pollution in these two continents and the longer time spent airborne to reach these two continents from Italy. Long plane travel is a known risk of respiratory infections [27,28].

Finally, youth (16-30 years; OR = 5.37; IC95% 1.15–25.06) and consumption of street vendor food (OR = 2.99; IC95% 1.32–6.80) were risk factors for dermatological problems. Identifying the presence of specific allergens in street vendor food is not always easy, so this could be the cause of rash or dermatitis in travellers.

4.4. Limitations

There are some limitations in our study. Firstly, our travellers are not representative of all travelers, as indeed they were enrolled among those who spontaneously requested pre-travel consultations. A wide range of travellers is excluded, especially those who, for various reasons, do not know or underestimate risks associated with staying in tropical and subtropical areas. Secondly, the proportion of non-Italian travellers, especially VFR, was also reduced due to linguistic barriers. This fact does not permit assessing the presence of different risk factors in these two categories of travellers. Thirdly, the type of restaurant where travellers consumed food and drink has not been investigated. This information could help to better understand the risk factors of gastrointestinal problems. Finally, statistical analyses in some subgroups of travellers, such as those with respiratory and dermatological diseases, are difficult to assess due to small sample size. An increase of the sample would be required.

5. Conclusions

Strict adherence to behavioral recommendations must be implemented especially in young people despite the non-seriousness of symptoms reported during the trip and upon return; indeed, no patient required hospitalization. About 19% of travellers reported symptoms within 60 days after their return; this highlights the importance of advising travellers upon their return on potential health risks, as during pre-trip counseling.

Gastrointestinal disorders, mainly diarrhea, are not associated with the intake of specific types of food or drink, but rather depend on more generic factors; this implies the need to alert the travellers not only to risk factors, but also on measures to be implemented in the event of disorder onset and which drugs to always have with them for self-medication.

Travellers must undertake journeys that require long flights, such as those traveling to America or Asia, must be warned of the potential risks of acquiring respiratory diseases and to the need to carry self-medication.

In travellers with pre-existing allergies/intolerances it is recommended they avoid the intake of foods in which it is not possible to identify the presence of possible allergens, such as street vendor food.

Finally, even adherence to chemoprophylaxis, mechanical prophylaxis and vaccination remains low. It is important to enhance awareness of the risk of vaccine preventable diseases during the consultation.

Pre-travel consultation is the only way to alert travellers to specific risks associated with their trip and to recommend specific prophylaxis. Regarding vaccinations, it is important to inform travellers on the best timing to go for pre-travel consultation, in order to be immunized on time.

Authors' contributions

All Authors have made a substantial contribution to conception, design of the article, as well as data analysis and interpretation, drafting the article and revising it critically for intellectual content; all authors approve the final version of the manuscript.

Ethical statement

The study was approved by Ethics Committee of Ferrara and Padova.

Funding

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Disclosure of interest

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors. G.G. received grants from GlaxoSmithKline Biologicals SA, Sanofi Pasteur MSD, Novartis, Crucell/Janssen, Seqirus, Sanofi Pasteur, Merck Italy, PaxVax and Pfizer for consultant work or taking part in an Advisory Board, expert meetings, being a speaker or an organizer of congresses/conferences and acting as investigator in clinical trials. A.P. received grants from GlaxoSmithKline and Pfizer for taking part to expert meetings. E.D.S. received grants from Pfizer for taking part in expert meetings. All remaining authors declare that they have no competing interest.

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