Frequency of Travelers with Chronic Conditions: Results from EPICHRONTRAV Study

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Abstract

Background: Current demographic changes and improvement of quality of life of patients with chronic conditions have direct consequences on international traveling.

Aim: The aim of this study was to assess needs in pre-travel health care in a sample of travelers with some chronic condition compared to healthy travelers moving abroad.

Methods: A retrospective adult cohort study was performed including attendees of a Travel Medicine Clinic in a 2-year period of time traveling to tropical areas.

Results: Over the 2-year period, 10,108 subjects presented to the travel clinic for pre-travel health care, 51.3% of whom were females with a mean age of 40.6 years (± 12.2 SD), mainly European (85.6%), and traveling to sub-Saharan Africa (31%). One in five travelers had one or more documented chronic disease [21.3% (95%CI 20.50 - 22.10)], statistically higher in males, older than 30 years of age, traveling to Middle East, as VFR or tourism purpose ($p < 0.05$). Main chronic conditions observed were cardiovascular diseases (10.9%, 95%CI 10.29 - 11.50) followed by endocrine-metabolic conditions (7.8%, 95%CI 7.32 - 8.37) and cancer (3.1%, 95%CI 2.77 - 3.44) statistically different by gender. While immunosuppressed conditions, independently of gender and travel destination, were present in 4.2% (95%CI 3.81 - 4.60) of travelers but higher in older than 30 years of age, traveling as VFR or organized tourism purpose ($p < 0.05$).

Conclusions: Findings from this large-scale study indicated a high amount of travelers with at least one chronic or immunosuppressed condition that should be taken in consideration into the pre-travel health advice in a current volatile, uncertain, complex and ambiguous scenario.

Keywords: Healthcare attendance; Chronic condition; Chronic illnesses; Travel medicine; Vaccination; Immunosuppressed conditions

Background

During the past decades, tourism has experienced a very important growth and diversification [1]. However in 2020 due to COVID-19 pandemic travel has been interrupted, and the pathogen susceptibility needs to be taken in consideration among travelers according to age and comorbidities. In a volatile, uncertain, complex and ambiguous scenario as COVID, the risk to travel with chronic conditions needs to be discussed. The traveler with chronic conditions demands for specific care and precautions to be observed, due to the increased global and serious incidence rate of infections, and Adverse Events Following Immunization (AEFI) in this population.

Elderly and chronic conditions are one of the main groups of high risk COVID infection and virulence. Elderly and adults of any age with at least one chronic condition can be more likely to get severely ill from COVID-19, so may need hospitalization, intensive care unit stay or a ventilator. On the other hand, the COVID-19 pandemic affects the standard of care for chronic patients. A better understanding will help to increase resilience of the health system and prepare adequately for next waves of the pandemic in the traveler country of origin or abroad.

The number of travelers had grown from 1756 million in 2000 to 2403 million in 2019 for tourism, visiting friends and relatives or medical purposes [1]. And, on the same period of time, the European population has grown, aged, and lived a strong wave of immigration. With aging of the population and longer survival, a growing proportion of elderly travelers is expecting to rise as well as the burden of multimorbid and comorbid chronic illnesses amongst travelers. The co-occurrence of diseases could have implications from a disease management point of view,

as the features of comorbid diseases and interactions to Travel Related Medications (TRM) can be much more complicated than a simple aggregation of individual illnesses or drugs [2,3].

Chronic disease is characterized because it causes a progressive deterioration that results in the loss of autonomy of the person, often through the appearance of outbreaks or crises that are aggravated over time [4]. The international traveler with chronic diseases needs to plan ahead to ensure medicines are available and used as directed for optimal therapeutic outcome if they travel for tourism or Visiting Friends and Relatives (VFR) as well [5,6].

From an Israeli study [7] amongst travelers a 18% of them presented at least one chronic Illness (TCI), and 13% were taking chronic medications. The proportion of TCI ranged from 4% in the first decade of life to 65% in the 8th decade. The highest number of chronic disease was among the 20 - 30 years age group. The median age (IQR) of TCI was 39.0 (23.1 - 58.2), compared to 24.2 (22.0 - 32.1) years of healthy travelers ($p < 0.001$). The major pre-existing medical conditions among TCI were endocrine/metabolic (38%), cardiovascular (26%) and pulmonary illnesses (16%).

As the population of travelers increases and diversifies, the number of travelers with chronic illness is expected to rise as well as the potential number of interactions, but few data is available as well as their impact on travel itinerary.

Methods

This retrospective adult cohort study was conducted at the Travel Medicine Clinic of the Hospital Universities de Bellvitge, in Barcelona, Spain, including attendees in the travel clinic between January 2017 and December 2018 traveling to tropical areas. The clinic is part of the public Catalan Health Service, so the pre-travel visit, vaccine administration (one or different types of vaccines) and antimalarial chemoprophylaxis recommendations are well established per national policies. Pre-travel counselling was provided by travel medicine specialists of the unit and included information and recommendations of safety and health travels, in accordance with U.S. Centres for Disease Control and Prevention (CDC) guidelines [8]. Comprising vaccine indications, food safety, diarrhoea prevention, and information about the implementation of interventions to avoid mosquito bites (such as mosquito nets, use of repellent, and appropriate clothes) and malaria chemoprophylaxis.

The Institutional Ethical Review Board approved the study protocol and granted approval for reviewing records for the purpose of the study. Confidentiality was maintained by omitting any personal identifying information from data collection.

From the travelers' recording tool, the following data were extracted for each individual: age, gender, area of origin, travel destination, purpose of travel (VFR and non-VFR, such as tourism and leisure, business, etc.).

The medical records reported the any pre-existing conditions or signs and/or symptoms present in a subject prior to the travel or study inclusion. Chronic illnesses were grouped according to the following groups: cardiovascular, endocrine and metabolic, digestive, otolaryngeal, genitourinary, hematologic, immunological, musculoskeletal, neurological, rheumatologic, cancer, ophthalmological, psychiatric, respiratory and dermatological disorders.

We define an immunosuppression condition as a characteristic presented in a person with one or more of the following conditions: Human Immunodeficiency Virus/Acquired Immunodeficiency Syndrome (HIV/AIDS), organ or stem cell transplant, hematologic malignancy, thymectomy, splenectomy, sickle cell anemia, or current receipt of an immunosuppressive medication. Concomitant medication was also recorded thanks to medical records if travelers have collected them in the pharmacy.

Afterwards, the medications were grouped according to the following groups: allergenic, anti-infectives, antineoplasics, cardiovascular agents, central nervous system agents, coagulation modifiers, gastrointestinal agents, genitourinary tract agents, hormones, immunologic agents, immunosuppressive agents, metabolic agents, nutritional products, plasma expanders, psychotherapeutic agents, radiologic agents, respiratory agents, topical agents. Immunosuppressive agents are defined as corticosteroids (equivalent to > = 20mg prednisone/day or equivalent), methotrexate, biological treatment agents that may suppress one or more immune pathways (including Tumor Necrosis Factor [TNF] blockers, rituximab, and other potentially immunosuppressive biologic therapies), calcineurin inhibitors (tacrolimus, cyclosporine), mycophenolate mofetil, antimetabolites (azathioprine, 6- mercaptopurine), sirolimus, leflunomide, hydroxyurea, alkylating agents, and immunosuppressive cancer chemotherapy.

Statistical Analysis

Continuous variables were expressed as mean and Standard Deviation (SD); categorical variables were described as number and percentage. The Student's t-test or Mann-Whitney U test for independent samples was used to assess differences between means; the chi-squared (χ^2) test was used to assess differences between categories. Univariate analyses were also conducted to determinate characteristics between travelers with chronic conditions and healthy travelers, and expressed as Crude Odds ratios. To perform logistic regression analysis, those variables with a p- value equal or less than 0.25 were, therefore, considered for inclusion. A stepwise backward selection procedure was used, fixing a p-value of ≤ 0.40 as the criterion for removing variables from the final multivariate regression models. Results were reported as crude and adjusted Odds Ratios (ORs) and 95% Confidence Intervals (CIs). All statistical tests were two-tailed, and a p-value ≤ 0.05 was considered statistically significant. Data were analysed using Stata 14 statistical software [9].

Results

Study population

Between January 2017 and December 2018, 10,108 adult travelers to tropical countries were attended to the Travel Medicine Clinic of the Hospital Universities de Bellvitge.

Approximately half (51.3%) of travelers were female younger than 40 years of age (54.4%). The vast majority of travelers were European (85.6%) or from Spain (85.0%). The mean age for the whole cohort was 40.6 years (± 12.2 SD), being 41.3 years (± 12.2 SD) for males and 39.8 years (± 12.1 SD) among females ($p > 0.05$). Ten percent of travelers were > 60 years old. No differences were observed between males and females according to age. Baseline characteristics of the study population are reported in comparative (Table 1).

Regarding travel information, the most popular destinations were Asia (40.5%) focusing to South East Asia (India, Pakistan or Bangladesh, 10.0%); and Indonesia or Philippines (9.5%). Afterwards Africa (31.0%), and Middle East countries were the less common destination (3.0%). No differences were observed between males and females according to destination ($p > 0.05$).

VFR travelers represented 10.3% of the cohort, quite similar to business travelers (9.5%) or in humanitarian mission (7.5%); while the majority of reasons for travel were tourism (72.7%) in an organized manner (42.3%). Females traveled more as tourists in a backpacker manner than males and less commonly for business or humanitarian reasons ($p < 0.01$).

Chronic diseases among travelers

The global prevalence (Table 1) of chronic disease was 21.3% (95% CI 20.50 - 22.10), being statistically higher ($p < 0.01$) among male (22.4%, 95%CI 21.24 - 23.57) and travelers older than 70 years of age (55.8%, 95%CI 48.87 - 63.33) than females and younger travelers. And presenting 2 or more chronic diseases 303 travelers were identified [3.0% (95% CI 2.66 - 3.33)].

The prevalence of chronic disease at 20-30years was 10.1%, at 31 - 40 years was 14.2%, at 41 - 50 years was 18.1%, at 51 - 60 years was 37.2%, at 61 - 70 years was 48.9%, and > 70 years was

Table 1: Baseline characteristics by study participants (n = 10,108) according to chronic conditions.				
	Total	**Healthy**	**Chronic diseases**	**Crude Odds ratio**
	N = 10,108	N = 7,955 (78.7%)	N = 2,153 (21.3 %)	
Gender				
Female	5,185 (51.3%)	4,137 (79.8%)	1,048 (20.2%)	1.00
Male	4,923 (48.7%)	3,818 (77.6%)	1,105 (22.4%)	1.14 (1.04 - 1.26)
Age group				
20-30	2,064 (20.4%)	1,856 (89.9%)	208 (10.1%)	1.00
31-40	3,434 (34.0%)	2,945 (85.8%)	489 (14.2%)	1.48 (1.25 - 1.76)
41-50	2,044 (20.2%)	1,673 (81.9%)	371 (18.1%)	1.98 (1.65 - 2.37)
51-60	1,559 (15.4%)	979 (62.8%)	580 (37.2%)	5.29 (4.43 - 6.31)
61-70	826 (8.2%)	422 (51.1%)	404 (48.9%)	8.54 (7.01 - 10.41)
> 70	181 (1.8%)	80 (44.2%)	101 (55.8%)	11.27 (8.13 - 15.61)
Travel destination				
Africa	3,133 (31.0%)	2,455 (78.4%)	678 (21.6%)	1.00
Middle East	303 (3.0%)	213 (70.3%)	90 (29.7%)	1.53 (1.18 - 1.99)
SEA	1,011 (10.0%)	783 (77.4%)	228 (22.6%)	1.05 (0.89 - 1.25)
East Asia	960 (9.5%)	788 (82.1%)	172 (17.9%)	0.79 (0.66 - 0.95)
Rest of Asia	2,123 (21.0%)	1,709 (80.5%)	414 (19.5%)	0.88 (0.76 - 1.01)
South America	1,921 (19.0%)	1,507 (78.5%)	414 (21.5%)	0.99 (0.87 - 1.14)
Central America	657 (6.5%)	500 (76.1%)	157 (23.9%)	1.14 (0.93 - 1.39)
Reasons for travel				
Hum. mission	763 (7.5%)	695 (91.1%)	68 (8.9%)	1.00
VFR	1,045 (10.3%)	841 (80.5%)	204 (19.5%)	2.48 (1.85 - 3.32)
Business	959 (9.5%)	870 (90.7%)	89 (9.3%)	1.05 (0.75 - 1.46)
Tourism				
Backpackers	3,071 (30.4%)	2,646 (86.2%)	425 (13.8%)	1.64 (1.25 - 2.15)
Organized	4,270 (42.3%)	2,903 (68.0%)	1,367 (32.0%)	4.81 (3.72 - 6.22)
Hum. Mission: Humanitarian Mission or cooperation VFR, travelers: Visiting Friends and Relatives SEA: South East Asia (including India, Pakistan, Bangladesh) East Asia (including Indonesia and Philippines) Rest of Asia (excluding India, Pakistan, Bangladesh, Indonesia and Philippines).				

55.8%. So the prevalence increases significantly (p –value < 0.01) by age up to eleven times from younger to 30 years to older than 70 years(Table 2).

The prevalence of chronic disease by travel destination was higher among travelers to Middle east and North Africa (29.7%) than the rest of destination (p- value < 0.01). So the prevalence increases significantly (p-value < 0.01) by destination up to 1.53 times from travelers to Middle East compared to Africa. And the prevalence of chronic disease according to reasons for travel was significantly (p- value < 0.01) higher among travelers traveling for tourism as organized tours (32.0%) or VFR (19.5%) than humanitarian mission. So the prevalence of chronic disease was statistically different according to reasons for travel.

It was estimated the relationship as Odds Ratio between chronic diseases and gender, age group, travel destination and reasons for travel. The analysis showed differences in chronic condition present according to destination, travel purpose, gender and age (Table 3). The prevalence of chronic diseases increases by gender, being 10% more frequent among males than females (Adjusted Odds ratio = 1.10, 95%CI 1.01 - 1.20) independently of age and travel destination or purpose. Also,

the prevalence of chronic conditions increases by age (p- trend < 0.01), being from 1.37 to 10.64 times higher than 20 to 30 years of age, independently of gender, travel destination and travel purpose. On the other hand chronic conditions was statistically higher between travelers to Middle East (Adjusted Odds ratio = 1.45, 95% 1.13 - 1.76), or traveling as VFR (Adjusted Odds ratio = 2.21, 95% 1.67 - 3.23) or tourism (backpackers, Adjusted Odds ratio = 1.46, 95% 1.17 - 2.05; organized tourism, Adjusted Odds ratio = 4.54, 95% 3.61-5.87) independently of age and gender.

Of the whole population (Figure 1), 2,153 presented at least one chronic disease, being mainly a cardiovascular disease (51.1%, n = 1,101) or an endocrine metabolic disease (36.8%, n = 793). Stratified data on age showed that cardiovascular disease and cancer were more common in older travelers (p < 0.05), while metabolic diseases was maintained quite stable independent of age from 30 to 60 (p > 0.05).

Figure 1 shows the total number of travelers who presented at least a chronic disease, being the first cause a CVD (10.2%; focused on acute myocardial infarction, coronary artery disease, stroke or peripheral arterial disease, hypertension), followed by a metabolic disease (7.97%; focused on Mellitus diabetes

Table 2: Baseline characteristics by study participants (n = 10,108) according to immunosuppressed conditions.				
	Total	**No immunosuppressed**	**Immunosuppressed**	**Crude Odds ratio**
	N = 10,108	N = 9,683 (95.8%)	N = 425 (4.2%)	
Gender				
Female	5,185 (51.3%)	4,954 (95.5%)	231 (4.5%)	1.00
Male	4,923 (48.7%)	4,729 (96.1%)	194 (3.9%)	0.88 (0.72 - 1.07)
Age group				
20-30	2,064 (20.4%)	2,021 (97.9%)	43 (2.1%)	1.00
31-40	3,434 (34.0%)	3,317 (96.6%)	117 (3.4%)	1.66 (1.16 - 2.36)
41-50	2,044 (20.2%)	1,964 (96.1%)	80 (3.9%)	1.91 (1.31 - 2.79)
51-60	1,559 (15.4%)	1,476 (94.7%)	83 (5.3%)	2.64 (1.82 - 3.84)
61-70	826 (8.2%)	743 (90.0%)	83 (10.0%)	5.25 (3.60 - 7.66)
> 70	181 (1.8%)	162 (89.5%)	19 (10.5%)	5.51 (3.14 - 9.68)
Travel destination				
Africa	3,133 (31.0%)	2,993 (95.5%)	140 (4.5%)	1.00
Middle East	303 (3.0%)	291 (96.0%)	12 (4.0%)	0.88 (0.48 - 1.61)
SEA	1,011 (10.0%)	973 (96.2%)	38 (3.8%)	0.83 (0.58 - 1.20)
East Asia	960 (9.5%)	930 (96.9%)	30 (3.1%)	0.69 (0.46 - 1.03)
Rest of Asia	2,123 (21.0%)	2,034 (95.8%)	89 (4.2%)	0.94 (0.71 - 1.23)
South America	1,921 (19.0%)	1,842 (95.9%)	79 (4.1%)	0.92 (0.69 - 1.22)
Central America	657 (6.5%)	620 (94.4%)	37 (5.6%)	1.28 (0.88 - 1.85)
Reasons for travel				
Hum. mission	763 (7.5%)	748 (98.0%)	15 (2.0%)	1.00
VFR	1,045 (10.3%)	1003 (96.0%)	42 (4.0%)	2.09 (1.15 - 3.79)
Business	959 (9.5%)	946 (98.6%)	13 (1.4%)	0.69 (0.32 - 1.45)
Tourism				
Backpackers	3,071 (30.4%)	2,991 (97.4%)	80 (2.6%)	1.33 (0.76 - 2.33)
Organized	4,270 (42.3%	3,995 (93.6%)	275 (6.4%)	3.43 (2.03 - 5.81)
Hum. Mission, Humanitarian Mission or cooperation				
VFR, travelers Visiting Friends and Relatives				
SEA South East Asia (including India, Pakistan, Bangladesh)				
East Asia (including Indonesia and Philippines)				
Rest of Asia (excluding India, Pakistan, Bangladesh, Indonesia and Philippines).				

Table 3: Adjusted Odds Ratios according to chronic or immunosuppressed conditions.

	Chronic		Immunosuppressed	
	Crude Odds ratio	[a]Adjusted Odds ratio	Crude Odds ratio	[a]Adjusted Odds ratio
Gender				
Female	1	1	1	- - - -
Male	1.14 (1.04 - 1.26)	1.10 (1.01 - 1.20)	0.88 (0.72 - 1.07)	
Age group				
20 - 30	1.00	1.00	1.00	1.00
31 - 40	1.48 (1.25 - 1.76)	1.37 (1.12 - 1.63)	1.66 (1.16 - 2.36)	1.42 (1.10 - 2.21)
41 - 50	1.98 (1.65 - 2.37)	1.81 (1.44 - 2.18)	1.91 (1.31 - 2.79)	1.84 (1.25 - 2.55)
51 - 60	5.29 (4.43 - 6.31)	4.47 (3.87 - 5.52)	2.64 (1.82 - 3.84)	2.02 (1.62 - 3.42)
61 - 70	8.54 (7.01 - 10.41)	7.38 (6. 71 - 9.52)	5.25 (3.60 - 7.66)	4.97 (3.09 - 7.46)
> 70	11.27 (8.13 - 15.61)	10.64 (7.82 - 13.12)	5.51 (3.14 - 9.68)	5.05 (3.01 - 9.47)
Travel destination				
Africa	1.00	1.00	1.00	- - - - -
Middle East	1.53 (1.18 - 1.99)	1.45 (1.13 - 1.76)	0.88 (0.48 - 1.61)	
SEA			0.83 (0.58 - 1.20)	
East Asia	1.05 (0.89 - 1.25)	1.01 (0.84 - 1.14)	0.69 (0.46 - 1.03)	
Rest of Asia	0.79 (0.66 - 0.95)	0.67 (0.58 - 1.02)	0.94 (0.71 - 1.23)	
South America	0.88 (0.76 - 1.01)	0.79 (0.67 - 1.03)	0.92 (0.69 - 1.22)	
Central America	0.99 (0.87 - 1.14)	1.05 (0.79 - 1.11)	1.28 (0.88 - 1.85)	
	1.14 (0.93 - 1.39)	1.07 (0.87 - 1.23)		
Reasons for travel				
Hum. mission	1.00	1.00	1.00	1.00
VFR	2.48 (1.85 - 3.32)	2.21 (1.67 - 3.22)	2.09 (1.15 - 3.79)	1. 90 (1.05 - 3.31)
Business	1.05 (0.75 - 1.46)	1.01 (0.66 - 1.38)	0.69 (0.32 - 1.45)	0.48 (0.20 - 1.57)
Tourism				
Backpackers	1.64 (1.25 - 2.15)	1.46 (1.17 - 2.05)	1.33 (0.76 - 2.33)	1.27 (0.68 - 2.27)
Organized	4.81 (3.72 - 6.22)	4.54 (3.61 - 5.87)	3.43 (2.03 - 5.81)	3.18 (1.92 - 4.58)

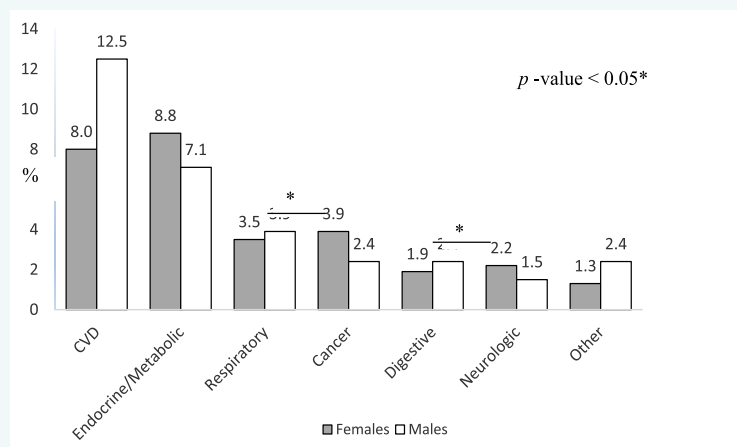[a]Adjusted for Age, gender, travel destination and reasons for travel.

Figure 1 Travelers by comorbidity and gender (n = 10,108)
*p- value < 0.05 by Chi squared test except in Respiratory (p- value = 0.299) and digestive disorders (p- value = 0.091)
CVD: Cardiovascular Disease

type II, hypothyroidism, Osteoporosis), respiratory disease (3.69%; focused on COPD or asthma), cancer (3.17%; focused on breast cancer or prostate cancer), digestive disease (2.14%; focused on RGE, celiac disease, inflammatory bowel disease or IBD), neurologic disease (1.86%; focused on Multiple sclerosis, migraines) and others that were considered.

Except for CVD, where the odds of CVD were about twice greater in the male population (1.56, p-value < 0.05), female travelers showed higher rates of metabolic diseases (1.24, p-value < 0.05), cancer (1.63, p-value < 0.05) and neurologic (1.47, p-value < 0.05). No significance was found in rates of respiratory ($p = 0.299$) or digestive ($p = 0.091$) diseases according to gender (Figure 1).

Of the whole population, 6,468 (64.0%) referred not taken any drug daily. Once they referred taken at least some drug daily, we observed a wide range of drugs taken from 1 (15.6%) to 15 (0.1%), being 2 or more drugs daily 20.4% of the cohort. The mean of drugs taken daily increased by age (p-value < 0.001) from 0.41(SD 0.89) in travelers younger than 30 years to 2.5 (SD 2.71) in older than 70 years of age.

A potential drug-drug interaction with TRM was identified in 48% of travelers using chronic medication. Fluoroquinolones and azithromycin were the most commonly implicated TRMs. A potential medical condition interaction with TRM was identified in 30% of travelers having chronic illnesses. Acetazolamide and mefloquine, were the most commonly TRMs implicated.

Immunosuppressed travelers

The global prevalence (Table 2) of immunosuppression was 4.2% (95% CI 3.81 - 4.60) without difference by gender (p-value = 0.283), but higher in patients of 50 years of age or older (7.21%, 95% CI 6.21 - 8.21) or traveling as organized tourist (6.4%, 95%CI 5.70 - 7.18).

The prevalence of immunosuppressed conditions (Table 3) increases by age (p-trend < 0.01), VFR (Adjusted Odds Ratio = 1.90, 95%CI 1.05 - 3.31) or organized tourism purpose (Adjusted Odds Ratio = 3.18, 95%CI 1.92 - 4.58), independently of gender and travel destination.

Discussion

This large-scale study, the first performed in Spain, offers a first important insight in travelers according to chronic medical condition.

It is important to remember that the travelers suffering from a chronic disease differs from the rest of travelers in sociodemographic characteristics. These travelers, in fact, were older than non-chronic disease travelers; were for the most part men; and, as expected traveling to Middle East for tourism or as VFR. The analysis of travel destination and reasons for travel were statistically significant mainly for chronic conditions.

First of all, the prevalence of chronic diseases among travelers should be noted that was reviewed by medical history not only self-reported by travelers. In fact, the overall prevalence differed from previous studies done among general population in our region. In Catalonia in 2014 it was reported a 38% of adults presenting at least one chronic disease, being higher among women (41.1% *versus* 34.9% in men) [10]. However we have to consider that it was included as a chronic disease cervicalgia, low back pain presented more than 90 days, anemia, allergies and others. Among travelers, in other studies, the prevalence have been estimated between 2.4% [11] or 79.2% [12] focused such a difference in the definition of chronic disease.

In the study by [11] the estimation of chronic disease prevalence among Israelis travelers (n = 394) aged 20 to 30 years or 60 years and older was 38.2% and 2.4% respectively defining it as an underlying medical condition self-reported by travelers. Hypertension (n = 33), hyperlipidemia (n = 21) and cardiovascular disorders (n = 18) were the most common among the elderly and asthma (n = 4) among the young ones [13].

Darrat, et al. [12] studied retrospectively older travelers (n = 337) attended in a travel clinic, presenting the majority of them (n = 267, 79.2%) a documented pre-existing medical condition. The most commonly reported medical conditions were hypertension (n = 26, 7.7%), dyslipidemia (n = 18, 5.3%), diabetes mellitus (n = 12, 3.5%), insect bite sensitivity (n = 11, 3.3%), and hypothyroidism (n = 9, 2.6%). So the definition also of a reported and documented medical condition it is crucial to compare our data and identify the source of information biases.

Other studies [4,7,14]obtained an overall prevalence of chronic disease quite close to ours although lower. A cross-sectional study Hochberg, et al. [14] among 5 travel clinics in the USA of 15,440 travelers described 2,769 (17.9%) of high-risk; 644 of 2,769 (23.3%) immunocompromised travelers, 2,056 (74.3%) with medical comorbidities, and 69 (2.5%) being a pregnant woman. High-risk patients were considered as immunocompromised, with medical comorbidities or pregnant. Stienlauf, et al. [7] was a retrospective study of 16,681 travelers evaluated about their medical history (chronic illnesses 18%, chronic medications 13%) by self-reporting. The percentage of chronic illnesses ranged from 4% in the first decade of life to 65% in the 8th decade. The major pre-existing medical conditions among travelers suffering a chronic illness were endocrine/metabolic (38%), cardiovascular (26%) and pulmonary illnesses (16%). Gagneux, et al. [4] developed a cross-sectional survey to evaluate pre-travel health advice seeking from GPs by travelers with chronic illness seen at a travel clinic. Three hundred and ninety-one (19.4%) travelers reported a history of a chronic illness. Arterial hypertension and diabetes mellitus were the most frequently reported illnesses, affecting, respectively, 168 (8.3%) travelers and 102 (5.1%). Only 810 (40.1%) travelers sought pre-travel advice from their GP. Hajj pilgrims (n = 388) were more likely to report a history of chronic illness than other travelers. In our study we observed 303 Hajj pilgrims not being different according to immunosuppression, but presenting a higher rate of chronic medical condition (29.7%).

Another source of data is medication taken to avoid possible interactions with immunization or chemoprophylaxis, and this can also be considered as a proxy to medical chronic condition. Aubry, et al. [15] studied 3,442 travelers attended in a French

travel clinic and observed that 11% of individuals reported a chronic medical conditions [hypertension (39%), asthma (20%), thyroid disease (15%) and depression (13%) and only 4% reported taking a daily medication, being the psychotropic and cardiovascular medications the most commonly used. Heslop, et al. [16] determined among adult travelers in an Airport the prevalence of medications for chronic diseases being taken by 47.7% of the 218 travelers interviewed. Although 75.2% of participants presented with no potential pharmaceutical risks, a total of 274 pharmaceutical care issues (PCIs) were identified across 61.5% of the participants, with an average of 2.04 PCIs per participant.

Han, et al. [17] 2015 reviewed 4,817 records of travelers having a documented medical history in 56% of them and 24% listed medications. The majority of travelers with preexisting conditions were female. In this scenario the information was recorded but it is not well define the chronic condition, so it is difficult also to compare the data.

Another study was performed among Australian long-term travelers (for more than 3 months, n = 316) by Halcomb, et al. [18] and nearly half of the respondents or their travel companion had a long-term illness that affected their daily life (n = 135; 42.7%) and 23.7% took every day at least one medication. However most of respondents were retired (n = 197; 62.3%), so the comparison to our population is it also difficult to be done.

Despite these limitations, the strengths of this study were that the cohort was properly selected and constituted a large number of participants; the study design was appropriate and the methodology of the study was accurate, reducing problems of bias.

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