COMPARISON OF HEALTH PROBLEMS AMONG OLDER VERSUS YOUNGER ADULT THAI INTERNATIONAL TRAVELERS

Ploi Lakanavisid[1], Kittiyod Poovorawan[2], Ngamphol Soonthornworasiri[3], Chayasin Mansanguan[2], Supitcha Kamolratanakul[2], Wasin Matsee[2], Suda Punrin[4], Watcharapong Piyaphanee[2] and Pornthep Chanthavanich[5]

[1]Hospital for Tropical Diseases, Faculty of Tropical Medicine, Mahidol University, [2]Department of Clinical Tropical Medicine, Faculty of Tropical Medicine, [3]Department of Tropical Hygiene, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand; [4]Queen Saovabha Memorial Institute, The Thai Red Cross Society, Bangkok, Thailand; [5]Department of Tropical Pediatrics, Faculty of Tropical Medicine, Mahidol University, Bangkok, Thailand.

Abstract. International travel is becoming more common among older adults who may have different health problems than younger adults. In this study we aimed to compare health problems among older versus younger adult Thai international travelers in order to inform pre-travel consultations. Inclusion criteria for older study subjects were aged ≥60 years, for younger study subjects were aged 18-45 years; both groups had traveled abroad for ≤31 days. Those with medical tourism purposes were excluded. The minimum numbers of study subjects calculated to be needed for the study were 185 travelers in each group. The study was conducted prospectively in Thai travelers with international destinations during March-December 2019 at the Hospital for Tropical Diseases, Queen Saovabha Memorial Institute, Don Mueang International Airport and Suvarnabhumi Airport, Bangkok, Thailand. The study groups (older and younger subjects) were matched by travel destinations. Each subject was interviewed twice following a standardized questionnaire: once before travel and once after travel. The questionnaire asked about demographic characteristics, travel itinerary, pre-travel preparation, health problems during travel, medication used, management and impact on the planned activities. A total of 500 subjects were included in the study: 250 older subjects (aged ≥60 years) (30.4% male) and 250 younger subjects (aged 18-45 years) (30% male) (p=0.922 for sex differences between groups). The number of overall health problem episodes among older subjects (2,171 episodes per 1,000 person-months) and younger subjects (2,222 episodes per 1,000 person-months) were not significantly different from each other (95% CI: 1,851-2,491; p=0.830). However, the proportion of older subjects who experienced musculoskeletal health problems (37.6%) was significantly higher (p=0.037) than younger subjects (28.8%) and the proportion of older subjects who experienced respiratory problems (13.2%) was significantly lower (p=0.031) than younger subjects (20.4%). There was no significant difference (p=0.540) in the proportion of older subjects with gastrointestinal problems (14.8%) than younger subjects (16.8%). Older subjects with underlying health problems or bringing travel health kits were significantly more likely to experience health problems during travel (adjusted odds ratio (OR)

= 2.87; 95% CI: 1.03-8.01; p=0.045), (adjusted OR = 2.18; 95% CI: 1.10-4.33; p=0.026), respectively. Older subjects were more likely to experience health problems if they traveled to Africa, Central and South America than if they traveled to Southeast Asia (adjusted OR = 5.57; 95% CI: 1.09-28.52; p=0.039). Overall, we found similar health problems among younger and older subjects, except musculoskeletal problems were higher among the older group. Subjects traveling to Africa, Central and South America should be counseled about their greater risk as well as older travelers with underlying health problems. Further studies are needed to determine what interventions are effective for reducing health problems among higher risk travelers or higher risk locations.

Keywords: health problems, Thai international travelers, old adult travelers, young adult travelers.

INTRODUCTION

The number of Thai international travelers is increasing continuously from 4.54 million in 2009 to 9.97 million in 2018 (NSO, 2019). Improvement in disease control and medical care have resulted in people living longer, and hence the increase in Thai older population from 7.49 million in 2010 to 11.14 million in 2019 (NSO, 2020; UN, 2019). Unfortunately, there are not yet reported data regarding the number of Thai travelers with international destinations as classified by age groups. The available data indicated that around a half of older Thai population (50.7%) usually travel within Thailand (NSO, 2017). Statistical data from the Travel Clinic, Hospital for Tropical Diseases, Mahidol University, and the Immunization and Travel Clinic, Queen Saovabha Memorial Institute, The Thai Red Cross Society, Bangkok, Thailand showed an increasing trend of older Thai travelers who travel abroad, but this is only a part of older travelers' data. The actual number is unreported. From all data, this has probably resulted in an increase in the number of older travelers with international destinations.

Older travelers may have different travel characteristics and health problems (CDC, 2019). They are more likely to have underlying medical problems and may use medications that interact with travel-related prophylaxis medications (Gautret *et al*, 2012; Ramos-Sesma *et al*, 2018); such as acetazolamide which is used for acute mountain sickness prevention may have interactions with simvastatin (medication for dyslipidemia) by increasing chance of rhabdomyolysis and interactions with warfarin (medication for heart disease) by increasing chance of bleeding (Sbaih *et al*, 2018).

There is little data regarding health problems among older Thai travelers. There is some data regarding older foreign travelers, but this may not apply to older Thai travelers. A previous study found the most common health problem among older European travelers was acute diarrhea, but this was less common than younger European travelers (Alon *et al*, 2010; Gautret *et al*, 2012; Vilkman *et al*, 2016). Several studies from Asia have

Correspondence: Assoc Prof Kittiyod Poovorawan, Department of Clinical Tropical Medicine, Faculty of Tropical Medicine, Mahidol University, Bangkok 10400, Thailand.
Tel: +66 (0) 2354 9168, Fax: +66 (0) 2354 9168
E-mail: kittiyod.poo@mahidol.ac.th

reported the most common heath problem among travelers of any age is respiratory problems (Olanwijitwong *et al*, 2017; Olanwijitwong *et al*, 2018; Piyaphanee *et al*, 2014).

The aim of this study was to compare health problems experienced during international travel among older Thai travelers with those experienced among young Thai travelers in order to inform pre-travel consultation advice.

MATERIALS AND METHODS

Study design

We conducted a multi-site prospective cohort questionnaire-based study among short-term (≤31 days) Thai travelers who traveled to international destinations during March-December 2019. The study was conducted at several sites: the Thai Travel Clinic, Hospital for Tropical Diseases, Mahidol University, Bangkok, Thailand, the Immunization and Travel Clinic, Queen Saovabha Memorial Institute, Thai Red Cross Society, Bangkok, Thailand, the non-travel outpatient clinic, Hospital for Tropical Diseases, Mahidol University, Bangkok, Thailand, the Travel Clinics at Don Mueang International Airport and Suvarnabhumi Airport, Bangkok, Thailand.

Study population

We enrolled 2 groups of subjects: younger subjects aged 18-45 years and older subjects aged ≥60 years. All subjects must have traveled for ≤31 days. Those who traveled for medical tourism were excluded.

The minimum number of subjects required for each study group (older subjects and younger subjects) was calculated to be 185 subjects based on the assumption that 20% of travelers who met age criteria as older and 35% as younger subjects would develop at least 1 health problem during travel (Alon *et al*, 2010; Gautret *et al*, 2012; Olanwijitwong *et al*, 2017; Olanwijitwong *et al*, 2018; Piyaphanee *et al*, 2014). We also used a confidence interval (CI) of 95% and a power of 90%. The sample size calculation was made using n4studies version 1.4.1 (http://n4studies.appstor.io/). We assumed the loss to follow up rate of study subjects would be about 35% (65 subjects per group) giving a final subject group size of 250 subjects per group for a total of 500 subjects.

For the purpose of our study, we divided travel destinations into 3 groups based on health risk (Freedman *et al*, 2006; Gautret *et al*, 2012): 1) Asia (East, South, West, Central, and Southeast Asia); 2) Europe, North America, Australia, New Zealand, and Oceania; 3) Africa, Central America and South America. The 2 study groups (older and younger subjects) were matched by travel destinations.

Data collection

All study subjects were interviewed twice following a standardized questionnaire: once before travel and once after travel. The pre-travel questionnaire (Questionnaire 1) asked about demographic characteristics, travel itinerary, pre-travel preparation and vaccinations. The post-travel interview was conducted within 7 days of returning to Thailand, and was conducted by phone call. Questionnaire 2 asked about subject health problems experienced during travel, medication used, management and impact of the health problems on planned activities. Any subjects who could not be interviewed because they could not be contacted during 3 phone call attempts over 2 days were withdrawn from the study.

A traveler might report several health problems during travel. Each health problem event was counted as a single episode of a health problem. The number of health problems experienced was calculated as the incidence of health problems per month per 1,000 travelers (1,000 person-months).

Statistical analysis

All data were analyzed using Statistical Package for the Social Sciences (SPSS), version 18.0.0 (International Business Machines Corporation, New York, NY). Continuous data were presented as means ± standard deviations (SD) while categorical data were presented as numbers and percentages. The t-test was used to compare continuous data and the chi-square test was used to compare categorical data. Logistic regression analysis was used to determine factors significantly associated with health problems among younger and older study subjects. Significant factors on univariate analysis were further analyzed using multivariate logistic regression analysis. A p-value < 0.05 was considered statistically significant.

Ethics

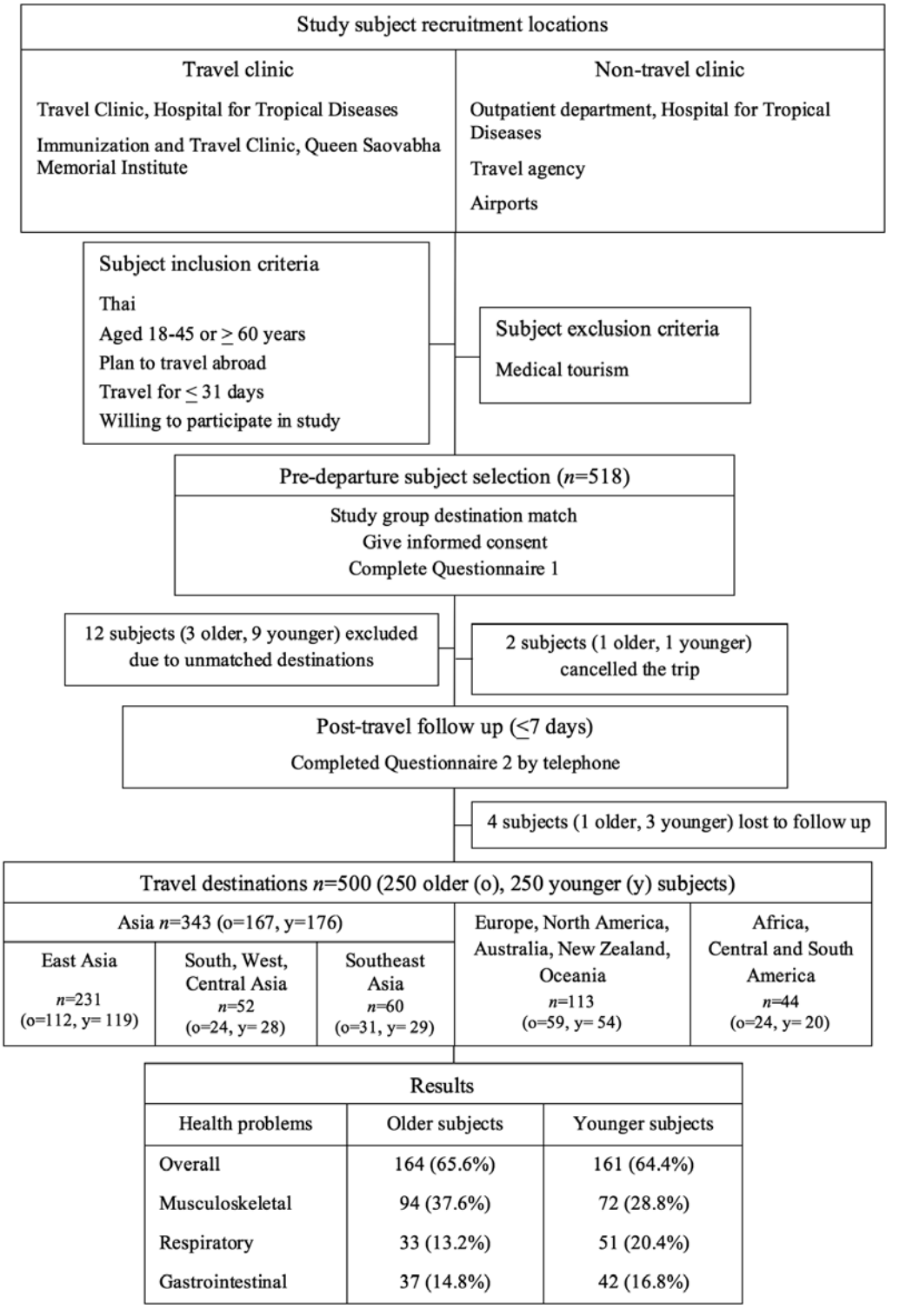
This study was approved by the Ethics Committee, Faculty of Tropical Medicine, Mahidol University (MUTM2019-021-01). Informed consent was obtained from each subject prior to participation in the study.

RESULTS

A total of 500 subjects (250 older and 250 younger subjects) completed both interviews and were included in the study (Fig 1); 69.6% of older subjects and 70% of younger subjects were female. The mean (± SD) ages of older and younger subjects were 65.81 (±5.16) and 32.84 (±6.55) years, respectively. The mean duration of travel for both groups was 9 days. Sixty point eight percent of older and 39.2% of younger subjects traveled in a package tour while 39.2% of older and 60.8% of younger subjects traveled on their own self-organized trip. Sixty-six point eight percent of older and 70.4% of younger subjects traveled to Asia; 23.6% of older and 21.6% of younger subjects traveled to Europe, North America, Australia, New Zealand, or Oceania and 23.6% of older and 21.6% of younger subjects traveled to Africa or Central and South America. The most commonly visited countries by older subjects were Japan (16.7%), China (10%), South Korea (4.3%), the United States of America (4%) and France (3.6%). The most commonly visited countries by younger subjects were Japan (20.4%), China (7%), South Korea (5.5%), the United States of America (4.9%) and France (3.6%); there was no significant difference in destinations by study group. Seventy-eight percent of older subjects and 34.4% of younger subjects had at least one underlying disease. The most common underlying diseases among older subjects were dyslipidemia (44.6%), hypertension (44.1%), and atopy or allergy (17.4%) and among younger study subjects were atopy or allergy (58.1%), gastrointestinal disease (19.8%), and dyslipidemia (10.5%). The most common vaccination given to both groups was the influenza (Table 1).

Health problems during travel

Sixty-five point six percent of older subjects and 64.4% of younger subjects experienced a health problem during travel. The incidence of health problems among older subjects was 2,171 per 1,000 person-months and among younger subjects was 2,222 episodes per 1,000 person-months (p=0.830). The proportion of older subjects who had musculoskeletal problems (37.6%) was significantly



Results		
Health problems	Older subjects	Younger subjects
Overall	164 (65.6%)	161 (64.4%)
Musculoskeletal	94 (37.6%)	72 (28.8%)
Respiratory	33 (13.2%)	51 (20.4%)
Gastrointestinal	37 (14.8%)	42 (16.8%)

Fig 1-Study flow process.

Table 1
Demographic characteristics of study subjects by group.

Demographic characteristics	Older (n = 250) n (%)	Younger (n = 250) n (%)	Total (n = 500) n (%)	p-value
Gender				
Female	174 (69.6)	175 (70.0)	349 (69.8)	0.922
Male	76 (30.4)	75 (30.0)	151 (30.2)	
Mean (±SD) age in years	65.81 (±5.16)	32.84 (±6.55)	49.32 (±17.53)	<0.001*
Occupation				
Government officer	13 (5.2)	64 (25.6)	77 (15.4)	<0.001*
Employee	21 (8.4)	121 (48.4)	142 (28.4)	
Self-employed	56 (22.4)	43 (17.2)	99 (19.8)	
Unemployed / Retired	160 (64.0)	3 (1.2)	163 (32.6)	
Student	0 (0)	19 (7.6)	19 (3.8)	
Current address				
Bangkok Metropolitan Area	211 (84.4)	204 (81.6)	415 (83.0)	0.405
Non-Bangkok Metropolitan Area	39 (15.6)	46 (18.4)	85 (17.0)	
Mean duration of travel in days	9.06 ± 6.18	8.70 ± 5.62	8.88 ± 5.90	0.004*
Median (min - max) length of travel	1 (1 - 11)	1 (1 - 6)	1 (1 - 11)	0.938
Destinations				
East Asia	112 (44.8)	119 (47.6)	231 (46.2)	0.883
South, West, Central Asia	24 (9.6)	28 (11.2)	52 (10.4)	
Southeast Asia	31 (12.4)	29 (11.6)	60 (12.0)	
Europe, North America, Australia, New Zealand, Oceania	59 (23.6)	54 (21.6)	113 (22.6)	
Africa, Central and South America	24 (9.6)	20 (8.0)	44 (8.8)	
Purpose of travel				
Tourism	215 (86.0)	210 (84.0)	425 (85.0)	<0.001*
Work, business	11 (4.4)	13 (5.2)	24 (4.8)	
Study, attend conference	7 (2.8)	25 (10.0)	32 (6.4)	
Visit friends or relatives	8 (3.2)	1 (0.4)	9 (1.8)	
Religious purposes	9 (3.6)	1 (0.4)	10 (2.0)	
Travel style				
Backpacker, self-organized	98 (39.2)	152 (60.8)	250 (50.0)	<0.001*
Organized tour	152 (60.8)	98 (39.2)	250 (50.0)	
Place subject recruited				
Travel clinic	53 (21.2)	106 (42.4)	159 (31.8)	<0.001*
Non-travel clinic	197 (78.8)	144 (57.6)	341 (68.2)	

Table 1 (Continued)

Demographic characteristics	Older (n = 250) n (%)	Younger (n = 250) n (%)	Total (n = 500) n (%)	p-value
History of underlying disease	195 (78.0)	86 (34.4)	281 (56.2)	<0.001*
Dyslipidemia	87 (44.6)	9 (10.5)	96 (34.2)	
Hypertension	86 (44.1)	4 (4.7)	90 (32.0)	
Atopy, allergy	34 (17.4)	50 (58.1)	84 (29.9)	
Musculoskeletal disease	33 (16.9)	6 (7.0)	39 (13.9)	
Diabetes mellitus	30 (15.4)	1 (1.2)	31 (11.0)	
Cardiovascular disease	16 (8.2)	0 (0)	16 (5.7)	
Gastrointestinal disease	12 (6.2)	17 (19.8)	29 (10.3)	
Urology and renal disease	10 (5.1)	2 (2.3)	12 (4.3)	
Thyroid disease	10 (5.1)	2 (2.3)	12 (4.3)	
Cancer	8 (4.1)	1 (1.2)	9 (3.2)	
Psychological disease	5 (2.6)	5 (5.8)	10 (3.6)	
Respiratory disease	3 (1.5)	1 (1.2)	4 (1.4)	
Hematological disease	2 (1.0)	4 (4.7)	6 (2.1)	
Immunodeficiency	0 (0)	1 (1.2)	1 (0.4)	
Others	17 (8.7)	9 (10.5)	26 (9.3)	
Location of pre-travel consultation (May have > 1 consultation)	88 (35.2)	103 (41.2)	191 (38.2)	0.167
Travel clinic	51 (58.0)	97 (94.2)	148 (77.5)	
Regular visited hospital	34 (38.6)	5 (4.9)	39 (20.4)	
Other hospitals	3 (3.4)	4 (3.9)	7 (3.7)	
Travel health kits preparation preparation	193 (77.2)	214 (85.6)	407 (81.4)	0.016*
Vaccination within 3 months	97 (38.8)	112 (44.8)	209 (41.8)	0.174
Influenza	88 (90.7)	78 (69.6)	166 (79.4)	
Mumps-Measles-Rubella	11 (11.3)	30 (26.8)	41 (19.6)	
Rabies	1 (1.0)	10 (8.9)	11 (5.3)	
Typhoid	8 (8.2)	18 (16.1)	26 (12.4)	
Hepatitis A	11 (11.3)	30 (26.8)	41 (19.6)	
Hepatitis B	1 (1.0)	9 (8.0)	10 (4.8)	
Diphtheria-Tetanus	7 (7.2)	3 (2.7)	10 (4.8)	
Diphtheria-Tetanus-Pertussis	13 (13.4)	17 (15.2)	30 (14.4)	
Yellow fever	8 (8.2)	13 (11.6)	21 (10)	
Meningococcal	3 (3.1)	4 (3.6)	7 (3.3)	
Japanese encephalitis	1 (1.0)	11 (9.8)	12 (5.7)	

Table 1 (Continued)

Demographic characteristics	Older (n = 250) n (%)	Younger (n = 250) n (%)	Total (n = 500) n (%)	p-value
Cholera	0 (0)	0 (0)	0 (0)	
Polio	0 (0)	1 (0.9)	1 (0.5)	
Zoster	6 (6.2)	0 (0)	6 (2.9)	
Pneumococcal	22 (22.7)	0 (0)	22 (10.5)	
Dengue	0 (0)	1 (0.9)	1 (0.5)	
HPV	0 (0)	4 (3.6)	4 (1.9)	
Varicella	0 (0)	1 (0.9)	1 (0.5)	
Vaccinations greater than 3 months	161 (64.4)	148 (59.2)	309 (61.8)	0.231
Influenza	132 (82.0)	109 (73.6)	241 (78.0)	
Mumps-Measles-Rubella	0 (0)	25 (16.9)	25 (8.1)	
Rabies	40 (24.8)	57 (38.5)	97 (31.4)	
Typhoid	5 (3.1)	9 (6.1)	14 (4.5)	
Hepatitis A	13 (8.1)	32 (21.6)	45 (14.6)	
Hepatitis B	10 (6.2)	56 (37.8)	66 (21.4)	
Diphtheria-Tetanus	56 (34.8)	43 (29.1)	99 (32.0)	
Diphtheria-Tetanus-Pertussis	11 (6.8)	28 (18.9)	39 (12.6)	
Yellow fever	9 (5.6)	18 (12.2)	27 (8.7)	
Meningococcal	1 (0.6)	3 (2.0)	4 (1.3)	
Japanese encephalitis	1 (0.6)	7 (4.7)	8 (2.6)	
Cholera	0 (0)	0 (0)	0 (0)	
Polio	0 (0)	5 (3.4)	5 (1.6)	
Zoster	12 (7.5)	1 (0.7)	13 (4.2)	
Pneumococcal	13 (8.1)	0 (0)	13 (4.2)	
Dengue	0 (0)	1 (0.7)	1 (0.3)	
HPV	0 (0)	3 (2.0)	3 (1.0)	
Varicella	0 (0)	3 (2.0)	3 (1.0)	

* Significant (p-value <0.05); SD: standard deviation.

greater (p=0.037) than the proportion of younger subjects (28.8%). The incidence of musculoskeletal problems among older subjects was 1,245 (95% CI: 998-1,491) episodes per 1,000 person-months and among younger subjects was 994 (95% CI: 768-1,219) episodes per 1,000 person-months (p=0.142). The proportion of older subjects who had respiratory problems (13.2%) was significantly lower (p=0.031) then the proportion of younger subjects (20.4%). The incidence of respiratory problems among older subjects was 437 (95% CI: 289-585)

episodes per 1,000 person-months and among younger subjects was 704 (95% CI: 513-895) episodes per 1,000 person-months (p=0.030). The proportion of older subjects with gastrointestinal symptoms (14.8%) was not significantly different (p=0.540) then the proportion among younger subjects (16.8%). The incidence of gastrointestinal problems among older subjects was 490 (95% CI: 333-646) episodes per 1,000 person-months and among younger subjects was 580 (95% CI: 406-753) episodes per 1,000 person-months (p=0.451) (Table 2).

Of the subjects with musculoskeletal problems, the most common condition was muscle strain but there was no significant difference in the proportions of older and younger subjects with musculoskeletal problems who had this condition (88.3% of older subjects, 94.4% of younger subjects; p=0.171). Of the subjects with gastrointestinal problems, the most common condition was constipation, but there was no significant difference in the proportions of older and younger subjects in gastrointestinal problems who had this condition (62.2% of older subjects, 45.2% of younger subjects; p=0.133). Of the subjects with respiratory problems, the most common condition was rhinorrhea. Significantly fewer (p=0.252) older subjects (60.6%) than younger subjects (72.5%) developed this condition (Table 3).

Most of symptoms were mild, 49.4% of older travelers were self-recovered in all health problems and 46.3% of older travelers were self-medicated without impact to the planned activities (99.4%). Management and impact of all health problems were not statistically different between older and younger subjects (p=0.157, p=0.990, respectively) (Table 4).

Factors associated with health problems among older subjects

On univariate analysis, duration of travel was significantly associated with health problems (adjusted OR = 2.40; 95%CI: 1.39-4.14; p=0.002) but on multivariate analysis it was not associated with health problems (adjusted OR = 1.83; 95%CI: 0.83-4.06; p=0.135).

On multivariate analysis, the factors significantly positively associated with health problems in older subjects were: having an underlying disease (adjusted OR: 2.87; 95% CI: 1.03-8.01; p=0.045), bringing travel health kits (defined as bringing first aid kits or symptomatic medication for common illness, such as common cold, dizziness, diarrhea, *etc*) (adjusted OR: 2.18; 95% CI: 1.10-4.33; p=0.026), and traveling to Africa, Central and South America (adjusted OR: 5.57; 95% CI: 1.09-28.52; p=0.039) and the factors significantly negatively associated with health problems in older subjects were being employed (adjusted OR: 0.26; 95% CI: 0.09-0.76; p=0.014) and living in a rural area rather than the Bangkok Metropolitan Area (adjusted OR: 0.39; 95% CI: 0.17-0.89; p=0.025) (Table 5).

Respiratory infection among subjects who had received influenza vaccination

Older subjects who received influenza vaccination during the 3-month period prior to travel experienced no significant reduction in the odds of contracting a respiratory infection during travel (crude OR = 0.47; 95% CI: 0.18-1.20; p=0.112).

Younger subjects who received influenza vaccination during the 3-month period prior to travel experienced no significant reduction in the odds of contracting a respiratory infection during travel (crude OR = 1.66; 95% CI: 0.86-3.19; p=0.132) (Table 6).

Table 2
Incidence of health problems during travel among study subjects.

Health problems	Older subjects Number of travel days = 2,266 days		Younger subjects Number of travel days = 2,174 days		*p*-value
	Number of episodes	Incidence per month/ 1,000 older subjects (95% CI)	Number of episodes	Incidence per month/ 1,000 younger subjects (95% CI)	
Overall incidence	164	2,171.2 (1,851.2-2,491.3)	161	2,221.7 (1,891.5-2,551.9)	0.830
Musculoskeletal system	94	1,244.5 (998.2-,490.8)	72	993.6 (767.9-1,219.2)	0.142
Gastrointestinal system	37	489.8 (333.3-646.4)	42	579.6 (406.0-753.2)	0.451
Respiratory system	33	436.9 (288.9-584.9)	51	703.8 (512.9-894.6)	0.030*
Central nervous system	22	291.3 (170.1-412.4)	31	427.8 (278.3-577.3)	0.163
Psychological system	19	251.5 (138.9-364.2)	9	124.2 (43.2-205.2)	0.074
Other symptoms	18	238.3 (128.7-348.0)	30	414.0 (266.9-561.1)	0.059
Dermatological system	12	158.9 (69.2-248.5)	29	400.2 (255.5-544.9)	0.005*
Urogenital system	4	53.0 (1.1-104.8)	2	27.6 (7.6-100.4)	0.443
Jet lag	4	53.0 (1.1-104.8)	11	151.8 (62.3-241.3)	0.059
Acute mountain sickness	3	39.7 (13.5-116.6)	14	193.2 (92.3-294.1)	0.006*
Cardiovascular system	1	13.2 (2.3-74.9)	1	13.8 (2.4-78.0)	0.977

* Significant (*p*-value <0.05).

Table 3
Heath problems experienced during travel among study subjects by group.

Health problems	Older (n = 250) n (%)	Younger (n = 250) n (%)	Total (n = 500) n (%)	p-value
Musculoskeletal system	94 (37.6)	72 (28.8)	166 (33.2)	
Muscle strain	83 (88.3)	68 (94.4)	151 (91.0)	0.516
Joint pain	11 (11.7)	4 (5.6)	15 (9.0)	
Abrasion or laceration	2 (2.1)	2 (2.8)	4 (2.4)	
Ecchymosis	1 (1.1)	1 (1.4)	2 (1.2)	
Ankle sprain	0 (0)	1 (1.4)	1 (0.6)	
Gastrointestinal system	37 (14.8)	42 (16.8)	79 (15.8)	
Constipation	23 (62.2)	19 (45.2)	42 (53.2)	0.482
Dyspepsia	5 (13.5)	8 (19.0)	13 (16.5)	
Mild diarrheaa	5 (13.5)	6 (14.3)	11 (13.9)	
Moderate diarrheab	1 (2.7)	6 (14.3)	7 (8.9)	
Abdominal fullness	3 (8.1)	4 (9.5)	7 (8.9)	
Vomiting	3 (8.1)	3 (7.1)	6 (7.6)	
Respiratory system	33 (13.2)	51 (20.4)	84 (16.8)	
Rhinorrhea	20 (60.6)	37 (72.5)	57 (67.9)	0.639
Blocked nose	14 (42.4)	24 (47.1)	38 (45.2)	
Cough	16 (48.5)	16 (31.4)	32 (38.1)	
Sore throat	11 (33.3)	18 (35.3)	29 (34.5)	
Dyspnea	5 (15.2)	5 (9.8)	10 (11.9)	
Central nervous system	22 (8.8)	31 (12.4)	53 (10.6)	
Headache	3 (13.6)	11 (35.5)	14 (26.4)	0.073
Dizziness	20 (90.9)	21 (67.7)	41 (77.4)	
Psychological system	19 (7.6)	9 (3.6)	28 (5.6)	
Insomnia	19 (100.0)	9 (100.0)	28 (100.0)	0.052
Depression	0 (0)	0 (0)	0 (0)	
Dermatological system	12 (4.8)	29 (11.6)	41 (8.2)	
Sunburn	2 (16.7)	18 (62.1)	20 (48.8)	0.022*
Insect bite	3 (25.0)	8 (27.6)	11 (26.8)	
Rash	6 (50.0)	5 (17.2)	11 (26.8)	
Mammal bite	1 (8.3)	0 (0)	1 (2.4)	
Urogenital system	4 (1.6)	2 (0.8)	6 (1.2)	
Urinary flow symptoms	1 (25.0)	0 (0)	1 (16.7)	0.050
Urinary incontinence	3 (75.0)	0 (0)	3 (50.0)	
Upper urinary tract infection	0 (0)	0 (0)	0 (0)	
Lower urinary tract infection	0 (0)	2 (100)	2 (33.3)	
Crossing > 2 time zones	161 (64.4)	158 (63.2)	319 (63.8)	
Jet lag	4 (2.5)	11 (7.0)	15 (4.7)	0.059

Table 3 (Continued)

Health problems	Older (n = 250) n (%)	Younger (n = 250) n (%)	Total (n = 500) n (%)	p-value
Traveling to altitude > 2,500 m	11 (4.4)	30 (12.0)	41 (8.2)	
High-altitude headache	0 (0)	3 (10.0)	3 (7.3)	0.406
Mild AMS	2 (18.2)	4 (13.3)	6 (14.6)	
Moderate-Severe AMS	1 (9.1)	7 (23.3)	8 (19.5)	
Cardiovascular system	1 (0.4)	1 (0.4)	2 (0.4)	
Syncope	1 (100.0)	1 (100.0)	2 (100.0)	1.000
Chest pain	0 (0)	0 (0)	0 (0)	

*Significant (p-value <0.05); + p-value of health problems in each system; a <3 unformed stools / day; b ≥3 unformed stools / day or > 1 mucous bloody stool; GERD: Gastroesophageal Reflux Disease; AMS: Acute Mountain Sickness; m: meters.

DISCUSSION

Nearly two-thirds of our subjects experienced health problems during travel. Previous studies reported a wide range of proportions of subjects who experienced health problems ranging from 6% to 79% according to different studied groups and destinations (Olanwijitwong *et a*l, 2017; Olanwijitwong *et al*, 2018; Piyaphanee *et al*, 2014).

When comparing our studied of Thai travelers with those from other countries (Table 7), respiratory problems were more common among Thai travelers while gastrointestinal problems were more common among non-Thai travelers (Olanwijitwong *et al*, 2017; Olanwijitwong *et al*, 2018; Piyaphanee *et al*, 2014).

The most common travel destination among our study subjects was East Asia; diarrhea was less common among those who traveled to East Asia than other destinations (Vilkman *et al*, 2016). In our subjects, constipation was the most common gastrointestinal problem reported. This may be due to dehydration and inactivity during long periods of travel (Ramos-Sesma *et al*, 2018).

In our study, subjects who traveled to Africa, Central and South America were more likely to have health problems similar to the results of previous studies (Freedman *et al*, 2006; Vilkman *et al*, 2016; Wieten *et al*, 2012).

In our study, being employed was significantly negatively associated with health problems during travel similar to the findings of a study from the USA (Stoney *et al*, 2016). In our study, living outside of the Metropolitan Bangkok Area was significantly negatively associated with health problems during travel. This could be because in our study, more subjects who lived outside the Metropolitan Bangkok Area were employed than those who lived in Bangkok.

In our study, subjects with a history of underlying disease were significantly more likely to experience health problems during travel than those without underlying disease, similar to the results

Table 4
Summary of management and impact of health problems during travel.

Summary of management and impact *n* (%)		Musculoskeletal system		Gastrointestinal system		Respiratory system		Central nervous system		Psychological system		Dermatological system		Urogenital system		Jet lag		Acute mountain sickness		Cardiovascular system	
		Old	Young	Old	Young	Old	Young	Old	Young	Old	Young	Old	Young	Old	Young	Old	Young	Old	Young	Old	Young
Management	Self-recovered	50 (53.2%)	41 (56.9%)	25 (67.6%)	27 (64.3%)	13 (39.4%)	19 (37.2%)	10 (45.5%)	10 (32.3%)	12 (63.2%)	8 (88.9%)	8 (66.7%)	15 (51.7%)	3 (75.0%)	2 (100%)	43 (93.5%)	45 (93.8%)	-	6 (42.9%)	1 (100%)	-
	Self-medicated	43 (45.7%)	30 (41.7%)	11 (29.7%)	12 (28.6%)	19 (57.6%)	22 (43.1%)	10 (45.5%)	21 (67.7%)	8 (36.8%)	1 (11.1%)	2 (16.7%)	11 (37.9%)	1 (25.0%)	-	2 (4.3%)	2 (4.2%)	3 (100%)	7 (50.0%)	-	-
	Over-the-counter medication	-	-	1 (2.7%)	2 (4.8%)	-	6 (11.8%)	1 (4.5%)	-	-	-	1 (8.3%)	-	-	-	1 (2.2%)	1 (2.1%)	-	-	-	-
	OPD	1 (1.0%)	1 (1.4%)	-	1 (2.4%)	1 (3.0%)	2 (3.9%)	1 (4.5%)	-	-	-	1 (8.3%)	3 (10.3%)	-	-	-	-	-	-	-	-
	Admit	-	-	-	-	-	2 (3.9%)	-	-	-	-	-	-	-	-	-	-	-	1 (7.1%)	-	1 (100%)
	p-value	0.863		0.767		0.181		0.212		0.159		0.261		0.439		0.988		0.279		0.157	
Impact	No impact	94 (100%)	72 (100%)	36 (97.3%)	41 (97.6%)	32 (97.0%)	49 (96.1%)	21 (95.5%)	31 (100%)	19 (100%)	9 (100%)	12 (100%)	29 (100%)	4 (100%)	2 (100%)	45 (97.8%)	48 (100%)	3 (100%)	13 (92.9%)	1 (100%)	-
	Changed, canceled plan	-	-	1 (2.7%)	1 (2.4%)	1 (3.0%)	2 (3.9%)	1 (4.5%)	-	-	-	-	-	-	-	1 (2.2%)	-	-	1 (7.1%)	-	1 (100%)
	p-value	1.000		0.928		0.830		0.231		1.000		1.000		1.000		0.554		0.633		0.157	

* Significant (*p*-value <0.05); OPD: Outpatient Department.

Table 5
Analysis of factors potentially associated with health problems during travel among study subjects.

Factors	Univariate		Multivariate	
	Crude OR (95%CI)	*p*-value	Adjusted OR (95%CI)	*p*-value
Gender				
Female	1 (ref)	-	-	-
Male	0.73 (0.42-1.27)	0.265	-	-
Travel destinations				
Southeast Asia	1 (ref)	-	1 (ref)	-
East Asia	1.50 (0.68-3.35)	0.318	1.45 (0.61-3.48)	0.404
South, West, Central Asia	2.81 (0.88-8.99)	0.081	1.71 (0.43-6.77)	0.445
Europe, North America, Australia, New Zealand, Oceania	1.97 (0.81-4.81)	0.135	1.11 (0.35-3.49)	0.863
Africa, Central and South America	6.56 (1.62-26.61)	0.008*	5.57 (1.09-28.52)	0.039*
Occupation				
Unemployed / Retired	1 (ref)	-	1 (ref)	-
Government officer	0.18 (0.04-0.88)	0.034*	1.28 (0.30-5.49)	0.742
Employee	0.37 (0.09-1.50)	0.164	0.26 (0.09-0.76)	0.014*
Self-employed	0.77 (0.20-2.91)	0.697	0.55 (0.27-1.09)	0.087
Current address				
Bangkok Metropolitan Area	1 (ref)	-	1 (ref)	-
Non-Bangkok Metropolitan Area	0.49 (0.25-0.98)	0.043*	0.39 (0.17-0.89)	0.025*
Purpose of travel				
Tourism	1 (ref)	-	-	-
Work, business	0.62 (0.18-2.09)	0.438	-	-
Study, attend conference	0.69 (0.15-3.14)	0.627	-	-
Visit friends or relatives	1.54 (0.30-7.83)	0.601	-	-
Religious purposes	1.03 (0.25-4.23)	0.969	-	-
Travel Style				
Backpacker, self-organized	1 (ref)	-	-	-
Organized tour	1.02 (0.60-1.74)	0.937	-	-
Duration of travel				
1-7 days	1 (ref)	-	1 (ref)	-
8-31 days	2.40 (1.39-4.14)	0.002*	1.83 (0.83-4.06)	0.135
History of underlying disease				
No	1 (ref)	-	1 (ref)	-
Yes	2.22 (1.21-4.09)	0.010*	2.87 (1.03-8.01)	0.045*

Table 5 (Continued)

Factors	Univariate		Multivariate	
	Crude OR (95%CI)	*p*-value	Adjusted OR (95%CI)	*p*-value
Medication of underlying disease				
No	1 (ref)	-	1 (ref)	-
Yes	1.73 (1.00-3.00)	0.052	0.78 (0.30-2.02)	0.604
Pre-travel consultation				
No	1 (ref)	-	-	-
Yes	1.52 (0.87-2.67)	0.143	-	-
Travel health kits preparation				
No	1 (ref)	-	1 (ref)	-
Yes	2.47 (1.35-4.52)	0.003*	2.18 (1.10-4.33)	0.026*
Vaccination within 3 months				
No	1 (ref)	-	-	-
Yes	1.63 (0.94-2.82)	0.083	-	-
Vaccination greater than 3 months				
No	1 (ref)	-	-	-
Yes	1.03 (0.60-1.78)	0.915	-	-

* Significant (p-value <0.05); OR: odds ratio; CI: confidence interval.

Table 6
Symptoms of upper respiratory infection after receiving influenza vaccination.

Influenza vaccination	Symptoms of upper respiratory infection			
	No *n* (%)	Yes *n* (%)	Crude OR (95%CI)	*p*-value
Older subjects				
≤ 3 months prior to travel				
No	140 (86.4%)	22 (13.6%)	0.47 (0.18 - 1.20)	0.112
Yes	82 (93.2%)	6 (6.8%)		
> 3 months prior to travel				
No	105 (89.0%)	13 (11.0%)	1.04 (0.47 - 2.28)	0.931
Yes	117 (88.6%)	15 (11.4%)		

Table 6 (Continued)

Influenza vaccination	Symptoms of upper respiratory infection			
	No *n* (%)	Yes *n* (%)	Crude OR (95%CI)	*p*-value
Younger subjects				
≤ 3 months prior to travel				
No	144 (83.7%)	28 (16.3%)	1.66 (0.86 - 3.19)	0.132
Yes	59 (75.6%)	19 (24.4%)		
> 3 months prior to travel				
No	119 (84.4%)	22 (15.6%)	1.61 (0.85 - 3.05)	0.143
Yes	84 (77.1%)	25 (22.9%)		

* Significant *p*-value <0.05; OR: odds ratio; CI: confidence interval.

of other studies (Dekkich *et al*, 2016; Mieske *et al*, 2010; Olanwijitwong *et al*, 2017; Ramos-Sesma *et al*, 2018; Wieten *et al*, 2012).

In our study, travel health kits preparation was associated with a significantly greater chance of having a travel-related health problem than those who did not have travel health kits preparation. A reason for this could be that subjects with a history of underlying disease were more likely to prepare for travel and having a history of underlying disease is associated with travel-related health problems.

Despite the results of upper respiratory infection after receiving influenza vaccine were not statistically significant, influenza vaccination is still recommended for routine immunization for older individuals (WHO, 2018).

A strength of our study was that it was prospective cohort and involved both pre-travel and post-travel evaluations.

A weakness of our study was that it was based on self-reported symptoms. No diagnosis by a healthcare professional was available during travel. Another weakness of our study was that the post-travel interview was conducted within 7 days of returning from travel. Disease showing up after this, such as those with longer incubation periods, could be missed. Another weakness of our study is many subjects were recruited from travel clinics which could skew our results to a population that may not reflect all travelers. Subjects attending travel clinics have greater concern about their health (Duval *et al*, 2006). Pre-travel consultation is uncommon in Asian travelers; a study performed in international airports in Sydney, Australia and Bangkok, Thailand found only 23% of Asian travelers (Heywood *et al*, 2012) or even lower with 2% in Japanese travelers (Namikawa *et al*, 2010) sought pre-travel advice from healthcare personnel versus 41% of Australian and 38% of other western travelers (Heywood *et al*, 2012). Further studies recruiting subjects from only public travel areas, such as airports, could compensate for this bias.

Table 7
Comparison of health problems among study subjects between our study and other selected studies.

	Our Study	Alon *et al* (2010)	Gautret *et al* (2012)	Wieten *et al* (2012)
Destinations	East Asia 44.8%	East Asia 53%	Asia 47.1%	SEA 20% South America 20%
Population	Thais	Israelis	International[a] Europe 49.1%	Dutch
Study year (s)	2019	2008	1997 - 2009	2010
Study age groups	18-45/y (*n*=250) ≥60/y (*n*=250)	20-30/y (*n*=203) ≥60/y (*n*=191)	18-45/y (*n*=56,042) ≥60/y (*n*=7,034)	≥60/y (*n*=90)
Overall health problems	65.6%	18.8%	N/D	24.4%
Proportions by symptoms	Musculoskeletal 33.8%	Acute diarrhea 9.9%	Acute diarrhea 16.7%	Acute diarrhea 50%
	Respiratory 20.2%	Respiratory 4.7%	Respiratory 14.6%	Respiratory 18.2%
	Gastrointestinal 16.2%	Unspecified fever 3.1%	Dermatological 14.5%	Chronic diarrhea 9.1% Dermatological 9.1% Unspecified fever 9.1%

SEA: Southeast Asia; N/D: No data available; y: years; [a] GeoSentinel Surveillance Network.

In conclusion, we found no significant difference in the overall proportions of older and younger study subjects who experienced health problems during travel. However, the proportion of older study subjects who experienced musculoskeletal problems during travel was significantly greater than younger subjects and the proportion of older subjects who experienced respiratory problems during travel was significantly lower than younger subjects. Having a history of an underlying disease, bringing travel health kits, and traveling to Africa, Central and South America were significantly positively associated with health problems during travel among older subjects and being employed and living in a rural area were significantly negatively associated with health problems during travel. Pre-travel consultations should take these data into consideration when giving advice to older study subjects. Further studies are needed to determine if these factors can be generalized to other older subjects in Thailand.

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