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High Rate of Recent Infections among International Travelers who bound for
Australian Cities from Suvarnabhumi Airport, Thailand, November – December 2007

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Abstract

Background: In 2006, over half a million of travelers departed from Thailand to Australia. Concern of upcoming influenza pandemic posed a challenge for public health professionals to find effective measures for delaying a global spread. We conducted a study to determine potential risk of transmission and factors related to the potential spread of infection across international border.

Methods: During November-December 2007, 188 travelers aged over 18 years departing from Thailand to Australia were randomly selected at Suvarnabhumi Airport in Samut Prakarn Province. A self-administered questionnaire was used for collecting data on demographics, travel patterns, diseases status and risk of acquiring infection.

Results: Of 114 surveyed, 74 (64.9%) entered Thailand for holidays. Majority of travelers (65.8%) spent less than 2 weeks in Thailand. Over half of them (55.3%) were males and mean age was 37.0 years (SD 13.9). Common illnesses in the past 2 weeks reported were URI (34.5%, 38/110) and diarrhea (12.7%, 14/110). For URI, 75.8% perceived that having coughing/ sneezing was a risk factor. Half of the travelers believed that consumption of contaminated food and water was a possible cause of diarrhea. About 39.5% (45/114) were never vaccinated against influenza. Regarding to the places visited, transportation used and events attended, only history of visiting farm in the past two weeks increased risk of having URI (Adjusted OR=4.64, 95% CI=1.01-21.20). In addition, staying at guest house (Adjusted OR=5.95, 95% CI=1.80-19.66) and staying at hotel more than 5 days per trip (Adjusted OR=20.48, 95% CI=1.26-333.08) were independent risk of diarrheal infection among travelers.

Conclusion: Nearly half of all travelers departing Thailand for Australia reported infections within 2 weeks of departure. URI was common among people who have recently visited a farm. Our findings suggested that improving surveillance and measures for international travelers was in urgent need to timely control the deadly respiratory infections, including SARS and novel influenza viruses.

Keywords : traveler , infections, risk factor, Thailand

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Introduction

Potential of spreading infectious diseases is rapid via a modern transportation, especially through airlines which had enormous growth in the past decade.[1] The number of flights are also increasing around the world, and also new huge airports with increasing passenger capacity such as (airport/abbreviate/ country/operated year/annual passenger 2007) Kansai International Airport/KIX/Japan/1994/20.0[2], Check Lab Kok International Airport/HKG/Hong Kong SAR/1998/ 47.8[3] and the latest aviation hub Suvarnabhumi Airport/ BKK/Thailand/2006/41.2.[4] The excellent example of classic intercontinental spreading of unknown pathogen via air transportation was Severe Acute Respiratory Syndrome (SARS) which occurred during March 2003 in Asia and spread to distant continents.[5] The vehicle of pathogen transportation was airplanes which were

habitat for people from different areas. Moreover, the cases fatality rate was as high as 9.6% that made people around the world panic[5]. At that time, the airlines were directly affected by SARS and there were sharply reduction of operated flights or many cancelled flights to the affected areas such as Hong Kong SAR and China mainland.[6] The number of international flights which operated to China in June 2003 was decreased to 45% compared with that of in June 2002. Moreover, the international flights operated between Hong Kong and US/Canada were dramatically decreased to 69% in June 2003 compared with that of in June 2002.[6]

So, there is no doubt that travel is a vector for global infection because it is a key of spreading infections around the world due to globalization, easy accessibility of travel, high speed of aircraft and behavior risk among travelers. Thus, the study on travelers' activities and the places they visited and purposive visiting is crucial, providing an insight into dynamic of disease transmission globally. Because communicable diseases may arise in areas of heavy tourism and then, travellers may undertake activities which may place them at risk and finally they can act as vectors to transport new diseases to new areas. The study objectives were aim to describe demographics and behavioural characteristics among travelers who bound for Australia from Suvarnabhumi Airport, determine potential risk of transmission of common infectious diseases among travelers who bound for Australian cities and finally identify risk factors related to acquiring of common infectious diseases such as diarrhea and upper respiratory tract infection among travelers who bound for Australian cities.

Methods

Design

The cross-sectional survey for descriptive study was conducted during November to December 2007 using a self-administered questionnaire that was available in Thai, Chinese and English languages. The questionnaire was used for collecting data from 5 sections, which included international travel pattern, activities in past 2 weeks and next 2 weeks, travel health, accommodations in Thailand and finally demographic data.

Cross-sectional study was introduced for identifying risk factors acquired infection in two disease classification:

Category 1. Upper respiratory infection (URI) case was a passenger who had developed any symptom of *rhinorrhea*, *sore throat* or *cough* in past 2 weeks within Thailand.

Category 2. Diarrheal case was a passenger who had perceived the occurrence of *diarrhea (watery or mucus bloody stool and at least 3 times of loose stool in a day)* in past 2 weeks within Thailand.

Participant and Destination

The participants were recruited among travelers who bound for Australian destinations in Suvarnabhumi Airport, Thailand. Proportion to airline company flight volume which were currently serving direct route to Australian cities was done and then each airline which had flights to Australian destinations was determined by sampling frame of flight numbers. Finally, quota of passengers in each flight was determined as sampling unit (Table 1).

The passengers were simply randomed at boarding areas, check-in counters and pre-X-ray areas. Thai Airway International PCL (TG) was allowed to make sampling at boarding areas by well trained health professional workers who had authority to access the boarding areas. Qantas airline (QF), Jet star airways (JQ), British Airways (BA) and Emirates (EK) were randomly sampled at check-in and pre-X-ray areas. Four eligible Australian cities had direct flights from Suvarnabhumi Airport, including to Sydney by (airline number/departure time) TG 993 (18.15), QF 002 (17.35, 1810) BA 009 (18.10) and EK 418 (19.50); to Melbourne by TG 999 (08.10) and JQ 030 (21.00); to Brisbane by TG 991 (08.00); and to Perth by TG997 (07.50) (Fig.1).

The eligible subject (passengers) must fulfilled the followings: 1) airline travelers who were departing from Suvarnabhumi Airport for a destination in Australia, 2) any short or long-term residents or travelers, including transit passengers, 3) only those aged 18 years or older, and 4) got a verbal consent from the passengers after they had received the study clearance by interviewee's assistant. This study was approved by IRB of Ministry of Public Health, Thailand.

Data Collection and Analysis

After obtaining questionnaires filled in by the passengers, the interview assistant checked for completion of data in the questionnaire. Double data entries were done by using Microsoft Access™. Descriptive and analytic studies were conducted by Epi Info version 3.3.2 (US CDC, Atlanta, USA). Multivariate study by multiple logistic regression was used to take confounders out by recruiting all risk factors which had p-value less than 0.2 enrolled in the final model.

Results

Overall, 114 passengers completed the questionnaire and response rate was 60.3% (114/188). The most common reasons for rejection and incomplete questionnaire were not having enough time and not interested in the study.

Descriptive Results

1. International Travel Pattern and Demographic

Among 114 passengers, there were 63 male and 51 female passengers. Mean age was 37.3 years (±13.9). Forty four percent was single, with 37% had bachelor degree attainment. The main reason for this trip was holiday/tourist (64.9%), followed by visiting friends and/or family (12.2%) and business (7.9%). The most common passengers were visitors with length of stay less than 2 weeks (65.8%) and length of stay 2-3 weeks (13.2%). Fifty four percent of passengers were traveling with at least one companion. Average number of companies were 2 persons (±1). Nationality of passengers who were going to Australian cities was Australian (34.8%), European

(13.4%), Indian (10.7%) and New Zealander (8.9%).

2. Activities in past 2 weeks and next 2 weeks

2.1 Activities in past two weeks

Mostly, the passengers stayed in a city (77.2%) with population more than 30,000, followed by village/town (36.0%) and a rural area (15.8%). For transportation, they experienced services with domestic airlines (49.1%), train or bus (37.7%) and car (30.7%). The places they visited included homestay (30.1%), jungle or forest (28.1%), zoo/wildlife park (21.9%), market that sold live animals (21.0%), home with farm animals (12.3%) and farm (9.6%). The crowded venues with more than 100 participants (eg. concerts, cinemas, festivals, wedding, night clubs and large restaurants) were mostly attended (64.4%).

2.2 Activities in next two weeks

The passengers expected that they would stay in the city (64.9%), followed by town/village (24.6%) and a rural area (7.0%). For transportation, they planned to use domestic airline (26.3%), car (26.3%) and train or bus (12.3%). They also planned to visit the places such as homestay (24.6%), jungle or forest (7.0%) and farm (6.1%). In addition, they planned to attend the crowded venues (45.4%) in next 2 weeks.

3. Travel Health Status

The symptoms that they developed in past two weeks included sore throat (19.3%), rhinorrhea (15.8%), diarrhea (12.3%), cough (11.5%), myalgia (7.0%), rash (5.3%) and fever (3.5%) (Fig. 2). Thirty eight travelers (34.5%) met the clinical criteria for URI and 14 travelers (12.7%) for diarrhea. The traveler who contacted with ill person and had fever in past 2 weeks was around 8.8% while illness persons included their family members or flat mate (4.4%), non-family members or friends (3.5%), and hotel guests or staff (1.8%).

The passengers were vaccinated for hepatitis A (14.9%), hepatitis B (13.2%), typhoid (9.7%), tetanus (7.0%), polio (5.3%) and diphtheria (5.2%) before this trip (Fig.3), but 34% of travelers were not vaccinated

before. However, the travelers who already had been vaccinated in the past included tetanus (43.9%), hepatitis B (43.0%), polio (38.7%) and hepatitis A (30.7%) (Fig.3). Overall vaccination status among these travelers was hepatitis A (52.6%), tetanus (49.1%) and hepatitis B (44.7%).

Travelers' knowledge about prevention methods of infectious diseases (hepatitis A, hepatitis B, influenza, measles and dengue) revealed that their understanding on appropriated prevention measures for each disease was below 50% (Fig. 4).

4. Accommodations in Thailand

Most of 87 passengers who had been in Thailand stayed in 1-2 hotel (51%), followed by 3-4 hotels (19%) and 5-6 hotels (6.4%). Most of them stayed at international chain hotel (37.7%), local owner hotel (27.2%) and guest house (22.8%). On average, they spent the time in hotel less than 12 hours per day and stayed at hotel for 3-4 days per trip. Forty percent of travelers experienced with swimming in pool of the hotel and 12% had serviced with sauna or spa in the hotel.

Analytic Results

1. Diarrheal risk among travelers

Twelve cases who met the clinical criteria for diarrhea and 102 travelers without diarrhea were compared for risk of diarrheal infection by cross-sectional study. Significant risk for diarrheal infection included staying at international chain hotel (PR=3.90, 95% CI=1.30-11.60), local owner hotel (PR=3.23, 95% CI=1.25-8.36), guest house (PR=3.38, 95% CI=1.32-8.65) and hotel more than 5 consecutive days per trip (PR=2.81, 95% CI=0.96-8.27) (Table 2). Multiple logistic regression was analyzed to take confounders out, and revealed that staying at guest house (Adjusted OR=5.95, 95% CI=1.80-19.66) and hotel more than 5 consecutive days per trip (Adjusted OR=20.48, 95% CI=1.26-333.08) were independent risks for diarrheal infection among travelers (Table 3).

2. URI risk among travelers

Thirty eight cases among travelers met the clinical criteria for URI and significant risk factors by univariate cross-sectional study included visiting a farm (PR=2.39, 95% CI=1.34-4.27), visiting home with live animal (PR=1.91, 95% CI=1.08-3.38) and visiting jungle or forest (PR=1.94, 95% CI=1.10-3.42) (Table 4). The multivariate analysis revealed visiting a farm (Adjusted OR=4.64, 95% CI=1.01-21.20) as the independent risk factor for URI among travelers (Table 5).

Discussions and Conclusion

Over three-fourth of passengers bound for Australia were visitors with duration less than 1 month and their ages were in the working age. The main purpose of trip was for leisure in the city with more than 30,000 population.

Suvarnabhumi Airport was an air transport hub of Australian and European countries or Indian subcontinent due to the high proportion of the European and Indian passengers bound for Australia. Nearly half of all travelers who bound for Australia from Suvarnabhumi Airport had experienced URI or diarrheal symptoms within 2 weeks before departure. Diarrheal symptoms were highly frequent among female passengers which might be due to natural habit of extra meal in contrast to URI cases. The visitors who lived longer in the same area or hotel had higher chance to get diarrheal disease. Staying in guest house had greater risk of diarrhea and staying at hotel was considered to be confounded by long length of stay. URI symptoms were common among farm visitors right before international traveling. Passengers who developed URI symptoms experienced with crowded transport such as train or bus, and crowded places such as zoo or wildlife park. A previous study conducted in Swedish travelers revealed that the most common travel-associated illnesses were diarrhea (36%) and respiratory tract infection (21%).[7] That was same as travel-associated illnesses in this study.
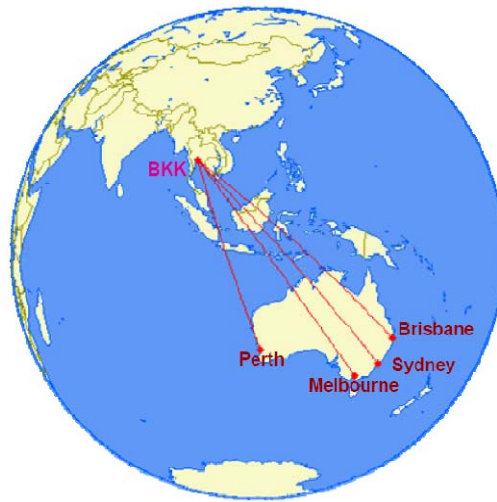
Figure 1 Route map of all airlines schedule at Suvarnabhumi airport to all destinations in Australia
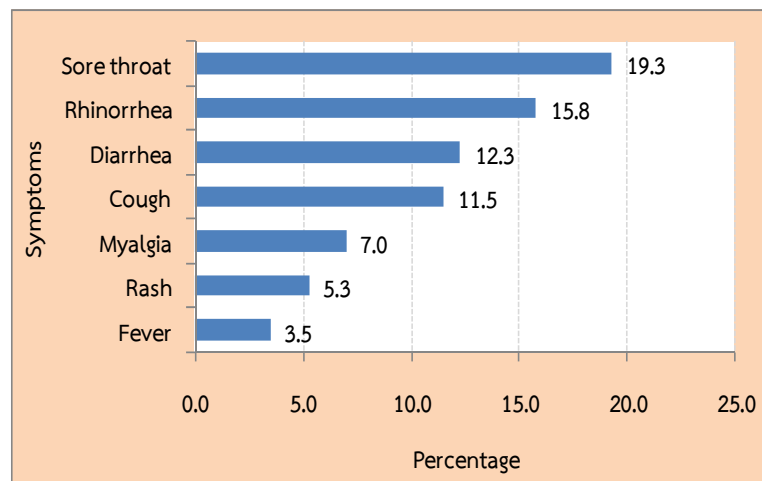

Figure 2 Symptoms and signs among travelers who perceived illness in past two weeks
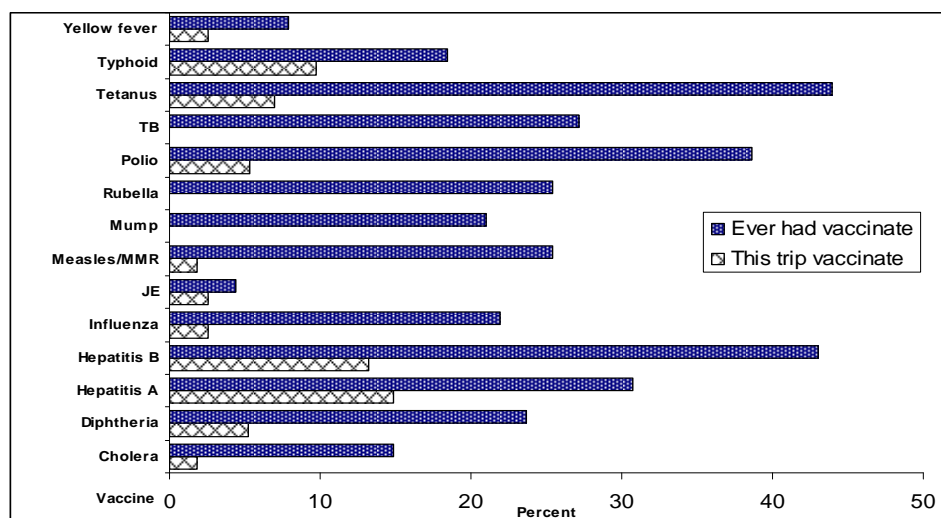during staying in Thailand, November - December 2007

Figure 3 History of vaccinate among travelers who bound for Australia from Thailand, November - December 2007

Table 1   Proportion of flight and quotas among all airlines directly serve to Australian cities at Suvarnabhumi Airport, November - December 2007

Airlines	Abb.	Destination	Proportion of Flights	Quotas
THAI Airways Intl	TG	Brisbane	10	10
THAI Airways Intl	TG	Melbourne	20	20
THAI Airways Intl	TG	Sydney	33	30
THAI Airways Intl	TG	Perth	12	10
Qantas	QF	Sydney	10	15
JetStar Airways	JQ	Melbourne	2	10
British Airways	BA	Sydney	8	15
Emirates	EK	Sydney	5	10
Total			100	120

Table 2   Univariate analysis of risk factors for diarrhea among travelers who bound for Australia from Thailand, November - December 2007

Risk Factors	Prevalence Ratio (95% CI)	P-value
Gender; Female	2.33 (0.83-6.49)	0.09
Spent in a rural area	0.97 (0.25-3.77)	0.96
Visited farm	0.60 (0.09-4.16)	0.59
Visited home where farm animals are kept	0.37 (0.05-2.63)	0.28
Visited slaughter house/abattoir	2.23 (0.42-11.93)	0.39
Visited jungle or forest	0.58 (0.17-1.96)	0.37
Visited market that sells live animal	0.26 (0.04-1.87)	0.13
Stayed in hotel chain	3.90 (1.30-11.6)	0.007*
Stayed in hotel local	3.23 (1.25-8.36)	0.01*
Stayed in guest house	3.38 (1.32-8.65)	0.01*
Stayed in friend's house	0.62 (0.09-4.29)	0.62
Stayed ≥ 5 days/trip	2.81 (0.96-8.27)	0.04*
Stayed ≥ 12 hrs/day	1.69 (0.56-5.10)	0.37
Stayed ≥ 3 hotels	1.56 (0.60-4.04)	0.36

* Statistical significant

Table 3   Multiple logistic regression analysis of independent risk factors among travelers who bound for Australia from BKK Thailand, November - December 2007

Risk Factors	Prevalence Ratio (95% CI)	Adjusted OR (95%CI)	P-Value
Gender; Female	2.33 (0.83-6.49)	2.37 (0.82-6.90)	0.18
Stayed in hotel chain	3.90 (1.30-11.6)	0.59 (0.23-1.46)	0.33
Stayed in hotel local owner	3.23 (1.25-8.36)	1.01 (0.59-1.76)	0.95
Stayed in friend's house	0.62 (0.09-4.29)	0.99(0.97-1.01)	0.85
Stayed in guest house	3.38 (1.32-8.65)	5.95 (1.80-19.66)	0.01*
Stayed ≥ 5 days/trip	2.81 (0.96-8.27)	20.48 (1.26-333.08)	0.07

*Statistical significant

Table 4 Univariate analysis of risk factors for URI among travelers who bound for Australia from Thailand, November - December 2007

Risk Factors	Prevalence Ratio (95% CI)	P-value
Female	1.00 (0.60-1.66)	0.99
Spent in rural area	1.29 (0.56-2.98)	0.54
Travel by train/bus	1.80 (0.91-3.55)	0.07
Visited farm	2.39 (1.34-4.27)	0.01*
Visited home where farm animals are kept	1.91 (1.08-3.38)	0.04*
Visited slaughter house/abattoir	1.02 (0.20-5.21)	0.98
Visited jungle or forest	1.94 (1.10-3.42)	0.02*
Visited zoo/wild life	1.56 (0.88-2.76)	0.14
Visited market that sells live animal	0.81 (0.38-1.72)	0.57
Stayed in hotel chain	1.08 (0.65-1.81)	0.76
Stayed in hotel local owner	1.44 (0.85-2.41)	0.19
Stayed in guest house	1.35 (0.77-2.38)	0.32
Stayed in friend's house	0.61 (0.17-2.11)	0.38
Stayed ≥ 5 days/trip	0.84 (0.48-1.48)	0.55
Stayed ≥ 12 hrs/day	0.83 (0.35-2.00)	0.67
Stayed ≥ 3 hotels	1.04 (0.57-1.90)	0.90

* Statistical significant

Table 5 Multivariate analysis of independent risk factors for URI among travelers who bound for Australia from Thailand, November - December 2007

Risk Factors	Prevalence Ratio (95% CI)	Adjusted OR (95%CI)	P-Value
Traveled by train/bus	1.80 (0.91-3.55)	1.31 (0.36-4.71)	0.67
Visited farm	2.39 (1.34-4.27)	4.64 (1.01-21.20)	0.04*
Visited home where farm animal are kept	1.91 (1.08-3.38)	1.26 (0.21-7.44)	0.79
Visited jungle / forest	1.94 (1.10-3.42)	3.21 (0.89-11.64)	0.07
Visited zoo/wild life park	1.56 (0.88-2.76)	0.61 (0.13-2.77)	0.52
Stayed local owner hotel	1.44 (0.85-2.41)	1.31 (0.36-4.71)	0.67

* Statistical significant

Hotel type and length of stay in Thailand were not associated with URI. Influenza vaccine was routinely vaccinated to only 25% passengers who bound for Australia. The knowledge on prevention measures among travelers was low. The appropriate message on prevention measures should be available at areas in the airport such as boarding, dining and common areas where the traveler could make notice.

High recent infection rates of URI and diarrhea among travelers in Thailand were observed. The main risk of URI was visiting a farm in past two weeks and that of diarrhea was staying longer than 5 consecutive days in the same hotel or area and staying in guest house. The possibility of international spread via airline is the crucial vector. The knowledge to prevent infection among travelers was lower than 30%. As the study limitation, high rate of non-response passengers could lead to selection bias and recall bias might be occurred.

Some airlines were not familiar with this kind of research and not well coordinated. Limited time for answering the questionnaire before departure was highly observed. Further actions should conduct on mathematic

modeling to predict the intercontinental spreading. In addition, this kind of study should be compared to another part of the world such as China, Indonesia, EU and USA.

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สำนักระบาดวิทยา กรมควบคุมโรค

<u>บทคัดย่อ</u>

ในปี พ.ศ. 2549 มีนักท่องเที่ยวเกือบครึ่งล้านเดินทางออกจากสนามบินสุวรรณภูมิ ไปยังเมืองต่างๆ ณ ประเทศออสเตรเลีย ความตระหนักถึงโอกาสที่จะเกิดการระบาดของไข้หวัดใหญ่เป็นสิ่งที่ท้าทายต่อเจ้าหน้าที่สาธารณสุขในการที่จะหามาตรการในการลด การกระจายไปยังประเทศต่าง   ๆ ทั่วโลก การวิจัยครั้งนี้ เพื่อจะระบุปัจจัยเสี่ยงของการติดต่อและปัจจัยเสี่ยงที่ทำให้เกิดโอกาส แพร่กระจายของการติดเชื้อระหว่างประเทศ   ทำการศึกษาในช่วงเดือนพฤศจิกายน-ธันวาคม 2550 ได้ทำการสุ่มนักท่องเที่ยวจาก เที่ยวบินต่าง ๆ ที่บินตรงไปยังเมืองต่าง ๆ ในประเทศออสเตรเลียโดยวิธี multistate sampling โดยนักท่องเที่ยวที่สุ่มได้ต้องมีอายุ มากกว่า 18 ปี   ที่กำลังเดินทางออกจากสนามบินสุวรรณภูมิ จังหวัดสมุทรปราการ จำนวน 188 ราย ใช้แบบสอบถามซึ่งตอบด้วย ตนเองโดยนักท่องเที่ยว เพื่อเก็บข้อมูลเกี่ยวกับลักษณะประชากร ลักษณะการเดินทาง สภาวะสุขภาพ และปัจจัยเสี่ยงของการติดเชื้อ ผลการศึกษา ในจำนวนนักท่องเที่ยว 114 ราย ที่ตอบแบบสอบถาม ร้อยละ 64.9 เดินทางเข้ามาท่องเที่ยวและพักผ่อนในประเทศไทย และในจำนวนนี้ ร้อยละ 65.8 อาศัยอยู่ในประเทศไทยน้อยกว่า 2 สัปดาห์ เป็นเพศชาย ร้อยละ 55.3% อายุเฉลี่ย 37 ปี (±13.9) นักท่องเที่ยวเจ็บป่วย ในช่วง 2 สัปดาห์ก่อนเดินทางออกนอกประเทศ ด้วยภาวะติดเชื้อระบบทางเดินหายใจส่วนบน ร้อยละ 34.5 และ อุจจาระร่วง ร้อยละ 12.7 สำหรับผู้ป่วยติดเชื้อทางเดินหายใจส่วนบน ร้อยละ 75.8 ให้ประวัติว่าสัมผัสไอหรือจาม ส่วนนักท่องเที่ยว ครึ่งหนึ่งเชื่อว่าการเกิดอุจจาระร่วงเฉียบพลันเกิดจากการรับประทานอาหารที่ปนเปื้อน ทั้งนี้นักเดินทาง ร้อยละ 39 ไม่ได้ฉีดวัคซีนป้องกัน ไข้หวัดใหญ่ก่อนเดินทาง สำหรับสถานที่ท่องเที่ยว ลักษณะการเดินทางและการเข้าชุมนุมในสถานที่ที่มีฝูงชนมาก พบว่านักท่องเที่ยวที่ มีประวัติไปยังบริเวณเกษตรกรรมเป็นปัจจัยเสี่ยงต่อการเกิดการติดเชื้อทางเดินหายใจส่วนบน (Adjusted Odds Ratio = 4.64, 95% CI = 1.01-21.20) ส่วนการอาศัยอยู่ในเกสเฮ้าส์ (Adjusted OR = 5.95, 95% CI = 1.80-19.66) และอาศัยอยู่นานเกิน 5 วัน (Adjusted OR = 20.48, 95% CI = 1.26-333.08) เป็นปัจจัยเสี่ยงของการโรคอุจจาระร่วงในนักท่องเที่ยว สรุปและวิจารณ์ นักท่องเที่ยวเกือบ ร้อยละ 50 ที่เดินทางออกจากสนามบินสุวรรณภูมิ สมุทรปราการ ไปยังเมืองต่างๆ ของประเทศออสเตรเลียรายงาน การติดเชื้อภายใน 2 สัปดาห์ก่อนการเดินทาง โดยผู้ป่วยที่มีการติดเชื้อระบบทางเดินหายใจส่วนบน พบมากในกลุ่มที่เดินทางไปยัง พื้นที่เกษตรกร ผลการศึกษานี้ ชี้ให้เห็นความจำเป็นเร่งด่วนที่ต้องพัฒนาการเฝ้าระวังและมาตรการสำหรับนักเดินทางระหว่างประเทศ เพื่อจะควบคุมการแพร่เชื้อไวรัสทางเดินหายใจที่อันตราย เช่น ซาร์ส และ ไข้หวัดใหญ่สายพันธุ์ใหม่

<u>คำสำคัญ</u>: นักท่องเที่ยว, การติดเชื้อ, ปัจจัยเสี่ยง, ประเทศไทย