TRAVEL PROFILE AND PURPOSE OF PEOPLE GETTING YELLOW FEVER VACCINE AT TRAVEL CLINICS

SIRIRAK THANASAKULPRASERT M.D.

ACKNOWLEDGEMENTS

I would like to express my special thanks of gratitude to all my teachers (Asst. Prof. Watcharapong Piyaphanee, Asst. Prof. Udomsak Silachamroon, Lect. Wirongrong Chierakul, Assoc. Prof. Kittiyod Poovorawan, Asst. Prof. Thundon Ngamprasertchai, Dr. Sopon Iamsirithaworn, Dr. Visal Moolasart, and Dr. Rome Buathong), who teach me and helped me in learning about so many new things I am very thankful to them. I would also like to thank my parents and friends for spiritual support and all supports.

TRAVEL PROFILE AND PURPOSE OF PEOPLE GETTING YELLOW FEVER VACCINE AT TRAVEL CLINICS

SIRIRAK THANASAKULPRASERT M.D., DEPARTMENT OF DISEASES CONTROL, MINISTRY OF PUBLIC HEALTH, sirithana@yahoo.com

ABSTRACT

Introduction: Traveling can lead travelers to health risks, especially travel to yellow fever transmission areas. These health risks possibly associate with travel profiles and purposes. Many Thais visited these areas with different travel profiles and purposes.

Objective: To study demographic data and travel profile of Thai clients for application of travel advice at travel clinics: Hospital of Tropical Diseases and Bamrasnaradura Infectious Diseases Institute, Thailand.

Materials and Methods: Cross-sectional study conducted among 379 Thais visited travel clinics between Dec 2018 - Jul 2019 using structured questionnaires.

Results: The major purpose were travel (227 participants, 59.9% of total participants). This study found 60 participants (15.6%) got underlying disease(s). About 29.8% of participants with underlying disease(s) stayed at destination(s) at least 30 days (most for the purpose of work). Median duration of travel was 14 days (IQR 9-180 days).

Conclusion: This study found many Thai travelers traveled and trended to stay at these destinations more than 14 days for the purpose of work. Some of these travelers traveled with the purpose of visiting friends and relatives (VFR) or military aids. These travelers not only needed yellow fever vaccination, but other illnesses should also be discussed. Knowing of these people travel profiles improved health care providers' understanding of the specific risks or needs, which possible strengthen the better match viewpoint on discussion, education, and prevention toward pre-travel consultation.

CONTENTS

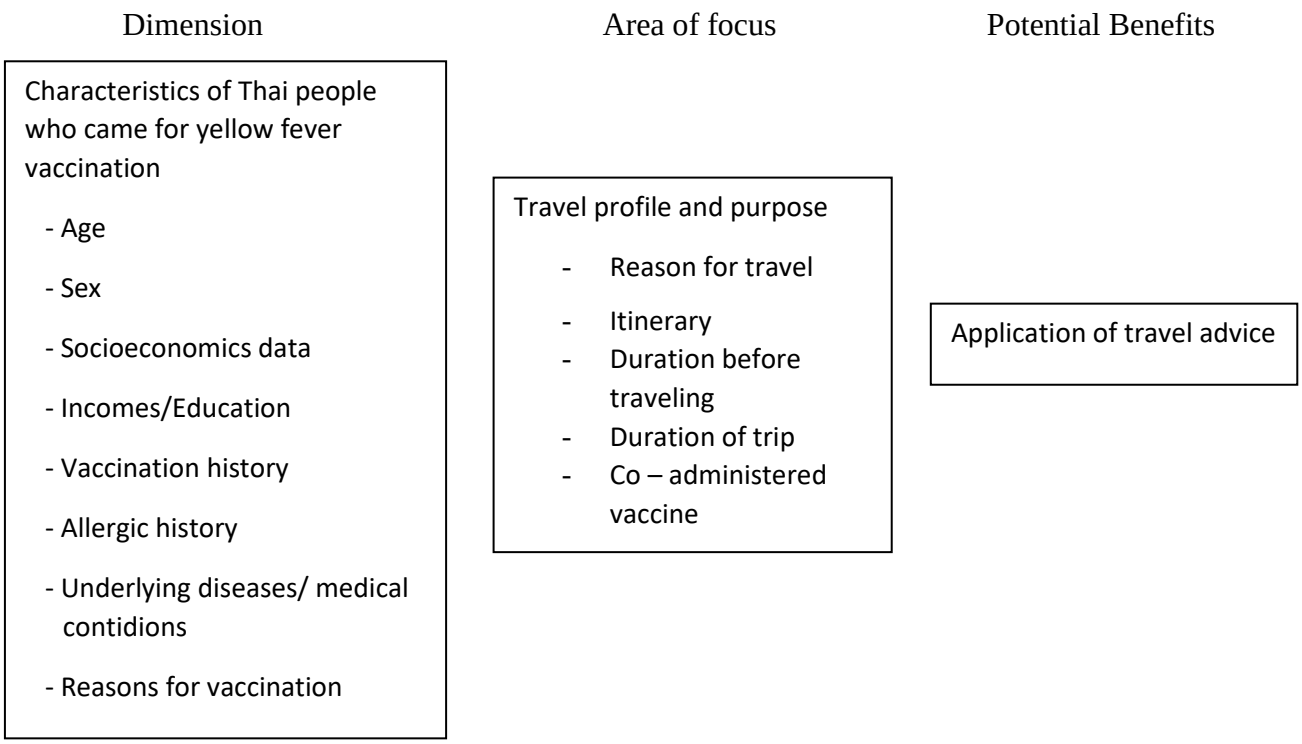
CHAPTER I: INTRODUCTION

As the growing trend of trade and travel, more people, more Thais traveled to many parts of the world included yellow fever transmission areas (1). Traveling people may have different characteristics. These characteristics needed specific approach from health care providers (2, 3). Travelers may have diversities among trips and may have their specific needs (4, 5). Previously, Thais who traveled to many yellow fever transmission areas which are possible at risks of many specific health issues (6).

Yellow fever is one of the most important vectors-borne diseases. Many parts of Africa and South America are yellow fever transmission areas (7-9). These areas located in tropical zone which may lead to other specific health risks, for example, malaria, dengue, chikungunya, typhoid fever, viral hepatitis etc. (6, 10-13) Yellow fever vaccine is required vaccine according to Thai laws.

Pre-travel consultations among Thais are less popular compared to westerners, required vaccination like yellow fever provide more opportunities for Thais to be more educate toward their health during travel (10, 14-16). Pre-travel consultation helps improving knowledge toward practices among travelers (17). The health education provided by these clinics should include the sufficient information for these people needed (2). This study aimed to sturdy the travel profiles and purposes among Thais.

Conceptual framework



Objective

- To study demographic data and travel profile of Thai clients for application of travel advice at travel clinics: Hospital of Tropical Diseases and Bamrasnaradura Infectious Diseases Institute, Thailand.

CHAPTER II: REVIEW OF THE LITERATURE

History of yellow fever and yellow fever vaccine

Yellow fever is one of the most important vector–borne diseases. Many parts of Africa and South America are yellow fever transmission areas (7, 8). The main route of yellow fever transmission facilitates by Aedes mosquitoes (18). Aedes mosquitoes, which abundant in Southeast Asia including Thailand (7, 9, 18). According to Thai law yellow fever classified as dangerous disease which imply this law to all people enter/come to Thailand.

In 17190, the term “yellow fever” was first recognized during an outbreak in Barbados. After that in the 18th century, yellow fever caused a serious trouble in colonial settlements in the Americas and West Africa (19).

In 1793, yellow fever outbreak killed 10% of the population in Philadelphia. The last outbreak in the United States happened in 1911 in Hawaii (19). In 1930s, there were several developments in vaccine production. In 19319, the 17D vaccine tried out among volunteers in New York, and went through field trials in Brazil in 1937. By 1939, more than 1 million Brazilians had vaccinated with the 17D vaccine while in French West Africa more than 100,000 persons had vaccinated the French neurotropic vaccine. The valuable epidemiology of yellow fever’s discoveries was made during this 1930s era, first in South America and then in Africa. This discovery showed that yellow fever virus transmission was associated with the relationship between monkeys and forest mosquitoes. According to these findings supposed that eradication of yellow fever virus was impossible and insisted a mandatory proof of yellow fever vaccination for people at risk of exposure to the yellow fever transmission areas (19).

Yellow fever was the first disease that the International Health Regulations (IHR) required a certificate of vaccination for people coming to and from yellow fever transmission areas (most countries in Africa and South America with Ae. aegypti – infested) (19). As the growing trend of trade and travel more Thais traveled to these yellow fever transmission areas. These Thais needed to get yellow fever vaccination and

needed protection against other illness. The health education provided by these clinics should include the sufficient information for these people needed.

In Thailand, we have been using 17D-114 yellow fever vaccine, Stamaril®, administer subcutaneous route. This vaccine has been proved the safety among travelers (20, 21). Generally, the adverse events following yellow fever vaccination can occur range from 10 - 30% (21-23). These adverse events are fever, headache, myalgia, local adverse events etc. These mild adverse effects can cure spontaneously. Anyway, the severe life – threatening adverse events, still were possible (21, 22).

Epidemiology of yellow fever and risks for travelers

A traveler's risk for acquiring yellow fever is depended on various factors: immune status, the place of travel, season, duration of exposure, and type of activities while traveling, the rate of virus transmission during travel etc. (6, 19, 22) Although the major indicator of the risk are the reported yellow fever cases, which possibly varied owing to a low transmission, a high immunity among the local population, or failure in case detection of the local surveillance systems (10, 13). This condition called "epidemiologic silence" which does not truly means no risk of transmission and should be considered to take the appropriated protective measures (14, 24).

The risk of yellow fever transmission usually high in rainy season in both Africa and South America. The sporadic cases can be found throughout the year. *Ae. aegypti* is the main vector of yellow fever transmission in urban area both Africa and South America. There were about 10 vaccinated traveler cases of yellow fever from 1970 until 2015. Among these cases, 75% died. There was only 1 vaccinated traveler case of yellow fever reported. And this case survived. In 2016, more than 15 travelers got yellow fever disease after visiting Angola, the time when one of the largest urban outbreaks was ongoing. None of these yellow fever traveler cases had been reported immunization with yellow fever vaccine (21).

The yellow fever risk is hard to estimate because of variations in epidemiologic and ecologic factors of transmission. For a 2- week stay, the presumed risks for being sick and fetal due to yellow fever for an unvaccinated traveler visiting an yellow fever transmission areas in:

- West Africa are 50 per 100,000 illness and 10 per 100,000 deaths, respectively
- South America are 5 per 100,000 illness and 1 per 100,000 death, respectively

However the risk of illness during outbreaks of the disease is likely higher and these estimated number based on the risk of indigenous populations, which can be higher or lower than travelers (21). The risk of getting yellow fever in South America is lower than the risk in Africa, because of different ecological factor (indirect contact

of monkey reservoirs and humans) and the higher level of immunity among local people (25).

Nowadays, there are many countries found indigenous cases of yellow fever transmission, mostly in Africa and South America regions as shown in Figure 2.1 and 2.2.

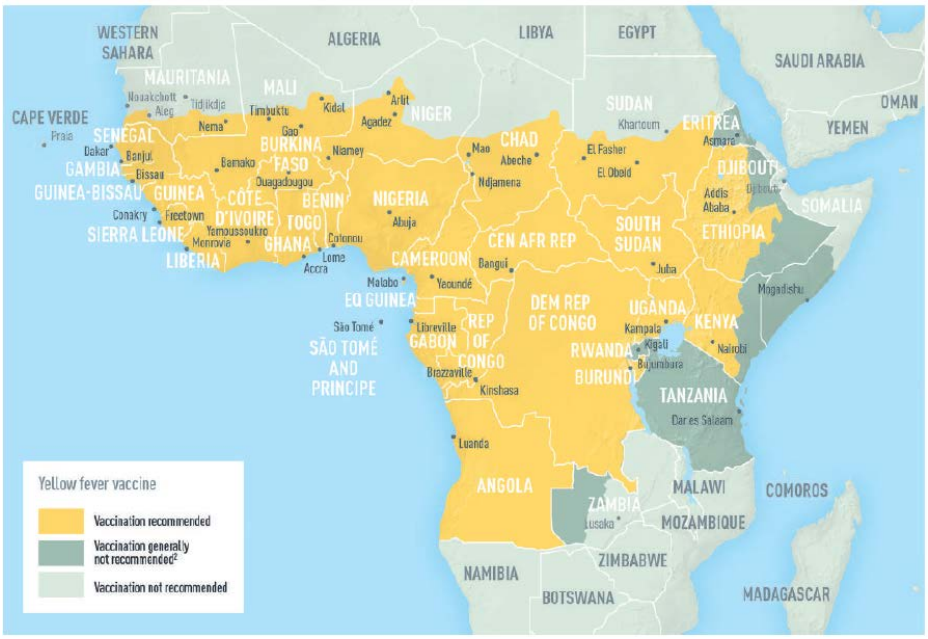


Figure 2.1 yellow fever transmission area in Africa REF (21)

In Africa, yellow are the area with high risk of transmission, dark green are the area with low risk of transmission and light green are the area with no risk of transmission (Figure 2.1) (21).

Figure 2.2 yellow fever transmission area in South America REF (21)

In South America, yellow color areas are the areas with high risk of transmission, dark green are the area with low risk of transmission and light green are the area with no risk of transmission (Figure 2.2) (21).

Law & Regulations

International Health Regulations (IHR)

To control and prevent the spreading of disease transmission to other countries, IHR provide the legal framework for international countries. Now, IHR

(2005) are the latest version of IHR and this version stated about the regulations for yellow fever. For the control and prevention of yellow fever, IHR mandates that people travel to and from yellow fever transmission areas need to be vaccinated against yellow fever and to be gotten the proof of validate yellow fever certificate (26, 27).

Thailand's Communicable Disease Act 2015

According to Thailand's Communicable Disease Act 2015, requires yellow fever vaccination for travelers arriving in Thailand from 42 countries affected by yellow fever (28).

The related published articles

Demographic data collecting from the travelers are individual also the risk of getting yellow fever. Questions for the travel profile like: who are they? Where exactly countries that they visited? What kind of activities that they do? When will be the peak period for people traveling there? Why do they go there? How do they go there?. These questions could tell us some information that might useful in term of disease control and acquire new knowledge for travel medicine, studying about the travel profile could leading us to the new knowledge in this topic (2-6, 10-17, 29). Chin BS et al, 2015, this study conducted in travel clinic in Seoul, South Korea during January to December 2011. They reviewed 3332 participants about the travel destination, purpose, duration, and vaccine/malaria prophylaxis prescriptions. They found male to female ratio (58:42), and the median age was 33 years overall (36 for men and 29 for women, $P < 0.001$). This study found yellow fever vaccination group got higher median age and shorter travel duration compared to non – yellow fever vaccination group. The most common purpose of travel were businesses (1117 participants) and tourism (1107 participants) About half of the participants were referred for yellow fever vaccine only (47.8%, more common among female), while 40.2% of participants received yellow fever vaccine in combination with other prescriptions. A subset of 12.0% of participants received prescriptions other than yellow fever vaccine. Most common destination of the cases came for yellow fever vaccine were eastern Africa, South America, western Africa's and middle Africa respectively (30).

CHAPTER III: METERIALS AND METHODS

This study conducted by using structure questionnaire during Dec 2018 – Jul 2019 at 2 travel clinics: Hospital of Tropical Diseases, Faculty of Tropical Medicine, Mahidol University and Bamrasnaradura Infectious Diseases Institute, Department of Diseases Control, Thailand. This study enrolled 379 participants and the informed consented provided. This study also submitted to ethical committees from both study sites. The sample size calculation was conducted by using population proportion sampling formula (31). This study presented with using frequency, percentage, median and interquartile range (IQR).

The enrollment process from the clinics will be done when participants have completed all standard process of the clinic [such as, see the physician, receive pre-travel advice, get the recommendation and vaccines]. Initially, subjects will be asked to fill a questionnaire that ask about their demographic data, travel characteristics, travel destination and purpose of the travel trip.

CHAPTER IV: RESULTS

In this study had total 379 participants, 54.1% male and 45.9% female. The participants had mean age of 39.0 ± 11.7 years. Of these 379 participants, 17 participants (4.5%) were in their 60s. The occupation in this study were employee (37.5%), business owner (17.2%), government officer (14.5%), freelance (12.4%), others (11.6%) and student (6.9%), respectively. The percentage of education were bachelor's degree (45.6%), higher education (31.4%), secondary school (12.9%), primary school (5.8%) and vocational certificate (4.2%), respectively (Table 4.1).

Table 4.1 Demographic data (N=379)

Demographic data		**N=379**	**%**
Sex	Male	205	54.1
	Female	174	45.9
Age (years)	< 18	3	0.8
	18 – 59	359	94.7
	≥ 60	17	4.5
	Mean age (years) $\pm$ SD	39.0 $\pm$ 11.7	
Occupation	Government officer	55	14.5
	Employee	142	37.5
	Business owner	65	17.2
	Freelance	47	12.4
	Student	26	6.9
	Others	44	11.6

Demographic data		N=379	%
Education	Primary school	22	5.8
	Secondary school	49	12.9
	Vocational certificate	16	4.2
	Bachelor's degree	173	45.6
	Higher education	119	31.4

Travel characteristics

The main purposes of participants for getting yellow fever vaccination were work (59.9%), travel (34.6%), military/humanitarian (2.1%), study (2.1%) and visiting friends and relatives (VFR) (1.3%). The major destination continents were Africa (62.0%), South America (28.0%), Middle East (6.3%), North America (0.8%), Europe (0.8%) and Asia (0.5%) (about 10% got yellow fever vaccine without the reason for travel to yellow fever transmission areas). The main accommodation type of the participants in this study were hotel (61.2%), camp (11.3%), friend/relatives' house (6.1%), hostel (2.4%), unknown (0.3%) others (18.7%). Interestingly, there were 11.3% and 6.1% of participants chose camp and friend/relatives' house as accommodation (Table 4.2).

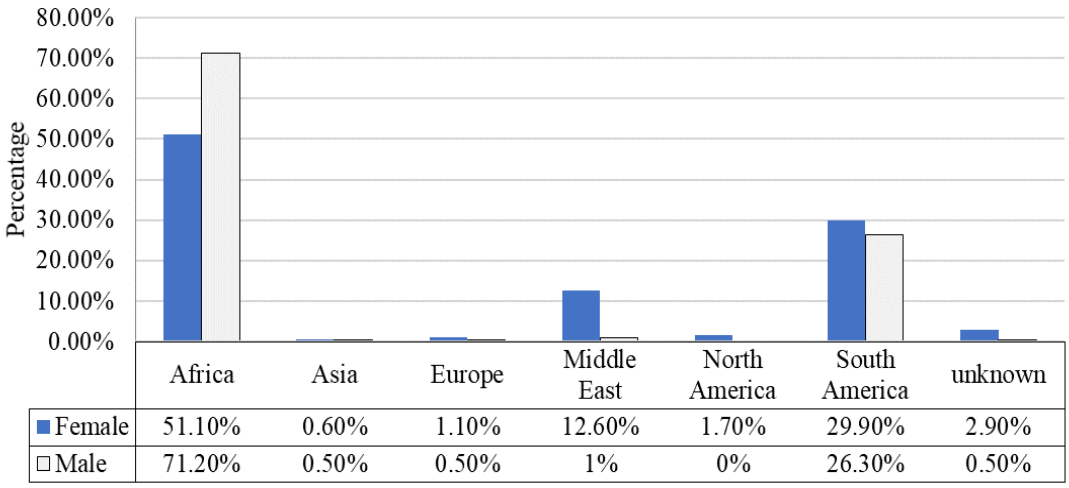
Table 4.2 Travel characteristics (N=379)

Travel characteristics		N=379	%
Major travel purpose	Military/humanitarian	8	2.1
	Study	8	2.1
	Tourism	131	34.6
	VFR	5	1.3
	Work	227	59.9

Travel characteristics		N=379	%
Major destination continent	Africa	235	62.0
	Asia	2	0.5
	Europe	3	0.8
	Middle East	24	6.3
	North America	3	0.8
	South America	106	28.0
	Unknown	6	1.6
Accommodation type	Hotel	232	61.2
	Hostel	9	2.4
	Friend/relatives' house	23	6.1
	Camp	43	11.3
	Others	72	19.0
Trip duration	Median duration of trip	14 days (IQR 9-180)	

Major destination continent in males were Africa (71.2%), South America (26.3%), Middle East (1.0%), Europe (0.5%), Asia (0.5%) and unknown (0.5%). Major destination continent in females were Africa (51.1%), South America (29.9%), Middle

East (12.6%), unknown (2.9%), North America (1.7%), Europe (1.1%) and Asia (0.6%) (as shown below in Figure 4.1).



	Africa	Asia	Europe	Middle East	North America	South America	unknown
Female	51.10%	0.60%	1.10%	12.60%	1.70%	29.90%	2.90%
Male	71.20%	0.50%	0.50%	1%	0%	26.30%	0.50%

Figure 4.1 Major destination continents divided by sex

Most of the participants (84.2%) got no underlying disease. Underlying disease(s) found among participants were HT/DLD (6.1%), DM (1.1%) and cancers (0.5%) and others (8.4%) (Table 4.3). Participants with underlying diseases (15.8%) got current medication. The participants with underlying disease and got current medication found HT/DLD (35.9%), DM (7.7%), cancers (2.6%) and others (17.9%) (data not shown).

Table 4.3 Health condition (N=379)

Health condition		N=379	%
Underlying disease	None	318	83.9
	HT/DLD	23	6.1
	DM	4	1.1
	Cancer	2	0.5
	Others	32	8.4

Health condition	N=379	%
Allergic history	11	2.9
Previous yellow fever vaccination	12	3.2
Current medication	39	10.3
Steroid/immunosuppressive agent use	0	0.0

Co-administered vaccines

Of these 379 participants, 210 participants (55.4%) got only the yellow fever vaccine on the day of visit. The co – administer vaccine were influenza vaccine (19.8%), meningococcal vaccine (17.7%), Td/Tdap (15.3%), hepatitis A vaccine (13.7%), typhoid vaccine (12.4%), cholera vaccine (4.0%), varicella vaccine (1.6%), MMR (1.3%) and rabies vaccine (0.8%).

Table 4.4 Percentage of participants got each co – administer vaccine (N=379)

co – administer vaccine	N=379	%
Influenza vaccine	75	19.8
Meningococcal vaccine	67	17.7
Typhoid vaccine	47	12.4
MMR	5	1.3
Rabies vaccine	3	0.8
Td/Tdap	58	15.3
Hepatitis A vaccine	52	13.7
Varicella vaccine	6	1.6
Cholera vaccine	15	4.0

Major travel purpose in males were work (67.8%), tourism (27.8%), military/humanitarian (2.4%) and study (2.0%). Major travel purpose in females were work (50.6%), tourism (42.5%), VFR (2.9%) and study (2.3%). Comparing to males, females were more likely to travel for a reason of tourism (42.5% comparing to 27.8%) and more likely to getting the yellow fever vaccination for a reason of travel to the Middle East. While both males and females preferred to choose hotel for the accommodation (Table 4.5). Accommodation type in male were hotel (61.5%), camp (18.5%), friend/relatives' house (2.9%), hostel (2.0%), unknown (0.5%) and others (14.6%). Accommodation type in females were hotel (60.9%), friend/relatives' house (9.8%), hostel (2.9%), camp (2.9%) and others (23.6%) (Table 4.5).

Table 4.5 Travel profile by sex

Travel characteristics		**Sex**			
		Male		**Female**	
		(N=205)	**%**	**(N=174)**	**%**
Major travel purpose	Military/humanitarian	5	2.4	3	1.7
	Study	4	2.0	4	2.3
	Tourism	57	27.8	74	42.5
	VFR	0	0.0	5	2.9
	Work	139	67.8	88	50.6
Accommodation type	Hotel	126	61.5	106	60.9
	Hostel	4	2.0	5	2.9
	Friend/relatives' house	6	2.9	17	9.8
	Camp	38	18.5	5	2.9
	Others	30	14.6	41	23.6
	Unknown	1	0.5	0	0.0

Most of participants in each occupation got yellow fever vaccine traveled to Africa (government officers (74.5%), employees (59.2%), business owners (53.8%), freelances (76.6%), students (65.4%) and others (50%)). No participant from government officers traveled to Asia, Europe, Middle East and North America (not yellow fever transmission area) got yellow fever vaccine. The highest number of participants got yellow fever vaccine without travel to yellow fever transmission area were employees (Middle East (9.9%), North America (1.4%), Asia (1.4%), and Europe (0.7%)). Middle East was the region with highest percentage of participants got yellow fever vaccination outside yellow fever transmission area in most occupation (employees 9.9%, business owners 3.1%, freelances 6.4%, students 7.7% and others 6.8%) (Table 4.6).

Table 4.6 Occupation and major destination by continent

Destination		Occupation											
		Government officers		Employees		Business owners		Freelances		Students		Others	
		N	%	N	%	N	%	N	%	N	%	N	%
Major destination continent	Africa	41	74.5	84	59.2	35	53.8	36	76.6	17	65.4	22	50
	Asia	0	0.0	2	1.4	0	0.0	0	0.0	0	0.0	0	0.0
	Europe	0	0.0	1	0.7	1	1.5	1	2.1	0	0.0	0	0.0
	Middle East	0	0.0	14	9.9	2	3.1	3	6.4	2	7.7	3	6.8
	North America	0	0.0	2	1.4	0	0.0	0	0.0	1	3.8	0	0.0

Destination	Occupation											
	Government officers		Employees		Business owners		Freelances		Students		Others	
	N	%	N	%	N	%	N	%	N	%	N	%
South America	12	21.8	36	25.4	27	41.5	7	14.9	6	23.1	18	40.9
unknown	2	3.6	3	2.1	0	0.0	0	0.0	0	0.0	1	2.3

Most of the participants got no underlying disease and no current medication (319 participants, 84.2%). Most of the participants with underlying disease got current medication (60.9% of participants with HT/DLD [hypertension/dyslipidemia]), 75% of participants with DM [diabetes mellitus], 50% of participants with cancer) (data not shown). The participants with underlying disease and got current medication found HT/DLD (35.9%), others (17.9%), DM (7.7%) and cancers (2.6%) (Table 4.7).

Table 4.7 Underlying disease and got current medication

Current medication	Underlying disease									
	None		HT/DLD		DM		Cancer		Others	
	N	%	N	%	N	%	N	%	N	%
Yes	14	4.4	14	60.9	3	75.0	1	50.0	7	22.6
No	305	95.6	9	39.1	1	25.0	1	50.0	24	77.4
Total	319	100.0	25	100.0	4	100.0	2	100.0	31	100.0

Of this study, the occupation in males were employee (37.1%), business owner (18.0%), freelance (16.1%), student (8.8%) and others (7.3%). The occupation in females were employee (37.9%), government officer (16.7%), others (16.7%) business owner (16.1%), freelance (8.0%) and student (4.6%). The percentage of education in male participants were bachelor's degree (39.0%), higher education (28.3%), secondary school (17.1%), primary school (9.8%) and vocational certificate (5.9%). The percentage of education among female participants were bachelor's degree (53.4%), higher education (35.1%), secondary school (8.0%), vocational certificate (2.3%) and primary school (1.1%) (Table 4.8).

Table 4.8 Demographic data by sex

Demographic data		**Sex**			
		Male		**Female**	
		(N=205)	**%**	**(N=174)**	**%**
Occupation	Government officer	26	12.7	29	16.7
	Employee	76	37.1	66	37.9
	Business owner	37	18.0	28	16.1
	Freelance	33	16.1	14	8.0
	Student	18	8.8	8	4.6
	Others	15	7.3	29	16.7
Education	Primary school	20	9.8	2	1.1
	Secondary school	35	17.1	14	8.0
	Vocational certificate	12	5.9	4	2.3
	Bachelor	80	39.0	93	53.4
	Higher education	58	28.3	61	35.1

When grouping education level into higher level (Bachelor & Higher education) and lower level (Primary school, Secondary school, and Vocational certificate), we found 87 participants with lower level of education (23%) and 292 participants with higher education level (77%). The median and IQR trip duration of people with lower level of education were 95 days and 60-300 days, respectively. The median and IQR trip duration of people with higher level of education were 13 days and 7-52 days, respectively (Table 4.9). And 74 of these lower level of education participants (85%) went aboard for the purpose of work.

Table 4.9 Trip duration by level of education

	Level of education	
	Lower	**Higher**
	N=87 (23%)	**N=292 (77%)**
Trip duration median (days)	95	13
Trip duration IQR (days)	60-300	7-52

CHAPTER V: DISCUSSION

More than half of Thai participants in this study got yellow fever vaccine administration according to the purpose of work. And more than 70% of the participants traveled to Africa which is yellow fever transmission areas. Major travel purposes were work (59.9%), tourism (36.4%), military/humanitarian (2.1%), study (2.1%) and VFR (1.3%). The continents which participants got YFV without traveled to transmission areas were Middle East (6.3%), North America (0.8%), Europe (0.8%), Asia (0.5%), respectively. Major travel purposes were work (59.9%), travel (36.4%), military/humanitarian (2.1%), study (2.1%) and VFR (1.3%). When we investigated more details, we found participants got YFV without travel to yellow fever transmission areas trended to have travel purpose for work. We also added this question later by telephone and many of these participants informed us it was the companies' policy.

Major travel purpose in males were work (67.8%), tourism (27.8%), military/humanitarian (2.4%) and study (2.0%). Major travel purpose in females were work (50.6%), tourism (42.5%), VFR (2.9%) and study (2.3%). When we compared to males, females were more likely to travel for a reason of tourism (42.5% females comparing to 27.8% males) and more likely to getting the yellow fever vaccination for a reason of travel to the Middle East. The highest number of participants got YFV with no yellow fever transmission area travel were Middle East (6.4%), which most of these participants were female traveled because the purpose of work, which probably inferred reason for getting YFV. From the telephone interview we also found these participants mainly worked as flight attendants from the airline in Middle East, might travel to Africa in the future and yellow fever vaccine considered requirement for company's flight attendants. Comparing to males, females were more likely to travel for a reason of tourism (42.5% comparing to 27.8%) and more likely to getting the yellow fever vaccination for a reason of travel to the Middle East.

Most of participants who got 3 co – administered vaccines or more planned to travel to Africa for at least 10 days. And influenza vaccine was the most popular co – administered vaccine (19.8%), follow by meningococcal vaccine (17.7%), as many of these participants traveled to meningitis belt, which also locates in Africa.

In this study, about half of participants, got yellow fever vaccine, were male and mean age of 39.0 ± 11.7 years old. This finding was approximately the same as many previous studies (3, 4, 32-35). The two most common travel purpose were work and travel same as the study among participants who got yellow fever vaccine from South Korea (30). More than half of participants in this study got yellow fever vaccine vaccination for a travel purpose of work. And more than 70% of the participants traveled to Africa which is yellow fever transmission areas. While Chin BS, et al 2016, found that the two main travel purposes among participants got yellow fever vaccine were work and travel (30). The median travel duration was 14 days (IQR 9-180 days). This finding might provoke cautions among health care provider toward infectious diseases like malaria, dengue, influenza etc. and other health issues (36-45). Travelers with specific purpose(s) (like VFRs, military aids) trended to stay for longer period more than 14 days and trended to contact with local people and rural areas, possibly exposure to other specific health risk(s) (21, 41, 44-54). Anyway about 10% of the participants found getting the yellow fever vaccine though not travel to yellow transmission areas. These participants explained that they got the yellow fever vaccine according to their company policies as some might transit via yellow fever transmission areas and some might be sent to the yellow fever transmission areas in the future. Among these who not travel to yellow fever transmission areas, Middle East got the highest percentage (6.3%). This finding has never been reported. Many of these participants were flight attendants of airlines in Middle East. Participants with underlying diseases (15.8%) got current medication. The participants with underlying disease(s) and got current medication(s) found hypertension/dyslipidemia (35.9%), others (17.9%), DM (7.7%) and cancers (2.6%). Since many of these participants traveled for a purpose of work and trended to stay for long period of time more than 14 days so these participants might be at risk of getting many health problems, risk of getting more severe or risk from limited treatment options. These travelers needed more specific attention (3, 44, 46). Most of participants who got 3 co – administered vaccines or more

planned to travel to Africa for at least 10 days, where possibly found many infectious diseases (36-43). Among the co-administered vaccine, influenza vaccine was the most popular co – administered vaccine (19.8%), follow by meningococcal vaccine (17.7%), as many of these participants traveled to meningitis belt, where respiratory tract infection also common (38, 50-54). People with lower education more likely to have longer duration aboard than those with higher education (55).

CHAPTER VI: CONCLUSION

Besides yellow fever, many of these yellow fever transmission areas also got other medical illness which possible educated to the participants. For example, Africa is the region with high prevalence of malaria, meningococcal meningitis, schistosomiasis etc. Some of these infectious diseases got no vaccine. Health education and prevention method still an important tool for maintain a good health while traveling abroad. Among the co-administered vaccine, influenza vaccine was the most popular vaccine among participants in this study. And many Thais traveled abroad for more than 10 days willing to protect themselves with the flu vaccine. People with lower education likely to get less co-administered vaccine and more likely to have longer duration aboard than those with higher education and need more attention and comprehensive advice, in term of insect bite prevention, respiratory disease prevention, food and water safety etc.

This study found many Thai travelers traveled and trended to stay at these destinations more than 14 days for the purpose of work. Some of these travelers traveled with the purpose of visiting friends and relatives (VFR) or military aids. These travelers, possibly stayed in rural areas and exposed to the risks as local people (but local people usually have some immunity to those risks as they usually exposed to those risks for several times). Therefore, these travelers were not only needed yellow fever vaccination, but other illnesses should also be discussed. Knowing of these people travel profiles improved health care providers' understanding of the specific risks or needs, which possible strengthen the better match viewpoint on discussion, education, and prevention toward pre-travel consultation.

REFERENCES

1. Organization. WT. Tourism highlights.2018.

2. Hamer DH, MacLeod WB, Chen LH, Hochberg NS, Kogelman L, Karchmer AW, *et al*. Pretravel Health Preparation of International Travelers: Results From the Boston Area Travel Medicine Network. Mayo Clin Proc Innov Qual Outcomes. 2017;1(1):78-90.

3. Weitzel T. Profile and complexity of travel medicine consultations in Chile: unicentric cross-sectional study. BMJ Open. 2020;10(9):e037903.

4. Lee VJ, Wilder-Smith A. Travel characteristics and health practices among travellers at the travellers' health and vaccination clinic in Singapore. Ann Acad Med Singap. 2006;35(10):667-73.

5. Leder K, Steffen R, Cramer JP, Greenaway C. Risk assessment in travel medicine: how to obtain, interpret, and use risk data for informing pre- travel advice. J Travel Med. 2015;22(1):13-20.

6. Chen LH, Wilson ME, Davis X, Loutan L, Schwartz E, Keystone J, et al. Illness in long-term travelers visiting GeoSentinel clinics. Emerg Infect Dis. 2009;15(11):1773-82.

7. World Health O. Yellow fever in the WHO African and American Regions, 2010. Wkly Epidemiol Rec. 2011;86(34):370-6.

8. Klitting R, Gould EA, Paupy C, de Lamballerie X. What Does the Future Hold for Yellow Fever Virus? (I). Genes (Basel). 2018;9(6).

9. Shearer FM, Longbottom J, Browne AJ, Pigott DM, Brady OJ, Kraemer MUG, et al. Existing and potential infection risk zones of yellow fever worldwide: a modelling analysis. Lancet Glob Health. 2018;6(3):e270-e8.

10. Leder K, Torresi J, Libman MD, Cramer JP, Castelli F, Schlagenhauf P, *et al*. GeoSentinel surveillance of illness in returned travelers, 2007-2011. Ann Intern Med. 2013;158(6):456-68.

11. Angelo KM, Kozarsky PE, Ryan ET, Chen LH, Sotir MJ. What proportion of international travellers acquire a travel-related illness? A review of the literature. J Travel Med. 2017;24(5).

12. Hunziker T, Berger C, Staubli G, Tschopp A, Weber R, Nadal D, *et al*. Profile of travel-associated illness in children, Zürich, Switzerland. J Travel Med. 2012;19(3):158-62.

13. Thomas RE, Lorenzetti DL, Spragins W, Jackson D, Williamson T. Active and passive surveillance

of yellow fever vaccine 17D or 17DD- associated serious adverse events: systematic review. Vaccine. 2011;29(28):4544-55.

14. Mendelson M, Han PV, Vincent P, von Sonnenburg F, Cramer JP, Loutan L, *et al*. Regional variation in travel-related illness acquired in Africa, March 1997-May 2011. Emerg Infect Dis. 2014;20(4):532-41.

15. Olanwijitwong J, Lawpoolsri S, Ponam T, Puengpholpool P, Sharma C, Chatapat L, *et al.* Incidence and spectrum of health problems among travellers to Myanmar. J Travel Med. 2018;25(1).

16. Piyaphanee W, Kittitrakul C, Lawpoolsri S, Tangkanakul W, Sa-Ngiamsak N, Nasok P, *et al.* Incidence and Spectrum of Health Problems Among Travelers to Laos. J Travel Med. 2014;21(3):163-8.

17. McGuinness SL, Spelman T, Johnson DF, Leder K. Immediate recall of health issues discussed during a pre-travel consultation. J Travel Med. 2015;22(3):145-51.

18. Kraemer MU, Sinka ME, Duda KA, Mylne AQ, Shearer FM, Barker CM, et al. The global distribution of the arbovirus vectors Aedes aegypti and Ae. albopictus. Elife. 2015;4:e08347.

19. Plotkin S OW, Offit P. Vaccines. Plotkin's Vaccines. 2018:1181 – 265Services SS. Population Proportion - Sample Size 2018 [cited 2018. Select Statistical Consultants [Internet]. Select Statistical Consultants. Available from: https://select-statistics.co.uk/ calculators/sample-size-calculator-population- proportion.

20. Cottin P, Niedrig M, Domingo C. Safety profile of the yellow fever vaccine Stamaril(R): a 17-year review. Expert review of vaccines. 2013;12(11):1351-68.

21. Brunette G. CDC health information for international travel. Oxford: University press; 2019. 2019:377-90.

22. Tiwari P, Ahlawat R, Gupta G. Safety of yellow fever vaccine in Indian travellers: A prospective observational study. The Indian journal of medical research. 2016;144(5):778-80.

23. Linsey NP, Rabe IB, Miller ER, Fischer M, Staples JE. Adverse event reports following yellow fever vaccination, 2007-13. Journal of travel medicine. 2016;23(5).

24. Brey PT, Fontenille D, Tang H. Re-evaluate yellow fever risk in Asia-Pacific region. Nature. 2018;554(7690):31.

25. Ling Y, Chen J, Huang Q, Hu Y, Zhu A, Ye S, et al. Yellow Fever in a Worker Returning to China

from Angola, March 2016. Emerg Infect Dis. 2016;22(7):1317-8.

26. Hardiman M, Wilder-Smith A. The revised international health regulations and their relevance to travel medicine. Journal of travel medicine. 2007;14(3):141-4.

27. Simons H, Patel D. International Health Regulations in practice: Focus on yellow fever and poliomyelitis. Human vaccines & immunotherapeutics. 2016;12(10):2690-3.

28. Law Center DoDC. Thailand's Communicable Disease Act 2015. 2015:19-21.

29. Wilder-Smith A, Leong WY. Importation of yellow fever into China: assessing travel patterns. Journal of travel medicine. 2017;24(4).

30. Chin BS, Kim JY, Gianella S, Lee M. Travel Pattern and Prescription Analysis at a Single Travel Clinic Specialized for Yellow Fever Vaccination in South Korea. Infect Chemother. 2016;48(1):20-30.

31. Services SS. Population Proportion - Sample Size 2018 [cited 2018. Select Statistical Consultants [Internet]. Select Statistical Consultants.Available from: https://select-statistics.co.uk/calculators/sample-size-calculator-populationproportion.

32. Marianneau P, Georges-Courbot M, Deubel V. Rarity of adverse effects after 17D yellow-fever vaccination. Lancet (London, England). 2001;358(9276):84-5.

33. Buhler S, Ruegg R, Steffen R, Hatz C, Jaeger VK. A profile of travelers--an analysis from a large swiss travel clinic. J Travel Med. 2014;21(5):324-31.

34. LaRocque RC, Rao SR, Tsibris A, Lawton T, Barry MA, Marano N, *et al*. Pre-travel health advice-seeking behavior among US international travelers departing from Boston Logan International Airport. J Travel Med. 2010;17(6):387-91.

35. Shady I, Gaafer M, Bassiony L. Travel risk behaviors as a determinants of receiving pre-travel health consultation and prevention. Trop Dis Travel Med Vaccines. 2015;1:3.

36. Chen LH, Wilson ME. The role of the traveler in emerging infections and magnitude of travel. Med Clin North Am. 2008;92(6):1409-32, xi.

37. Antwi S, Parola P, Sow D, Sornin V, Henrion M, Gautret P. Familial cluster of exposure to a confirmed rabid dog in travelers to Algeria. Travel Med Infect Dis. 2017;16:46-8.

38. Askling HH, Rombo L. Influenza in travellers. Curr Opin Infect Dis. 2010;23(5):421-5.

39. Hashim S, Ayub ZN, Mohamed Z, Hasan H, Harun A, Ismail N, et al. The prevalence and preventive measures of the respiratory illness among Malaysian pilgrims in 2013 Hajj season. J

Travel Med. 2016;23(2):tav019.

40. Radha S, Murugesan M, Rupali P. Drug resistance in Salmonella Typhi: implications for South Asia and travel. Curr Opin Infect Dis. 2020;33(5):347-54.

41. Zimmermann P, Mühlethaler K, Furrer H, Staehelin C. Travellers returning ill from the tropics - a descriptive retrospective study. Trop Dis Travel Med Vaccines. 2016;2:6.

41. Fenollar F, Mediannikov O. Emerging infectious diseases in Africa in the 21st century. New Microbes New Infect. 2018;26:S10-S8.

42. Boyce MR, Katz R, Standley CJ. Risk Factors for Infectious Diseases in Urban Environments of Sub-Saharan Africa: A Systematic Review and Critical Appraisal of Evidence. Trop Med Infect Dis. 2019;4(4).

43. Mizuno Y, Kudo K. Travel-related health problems in Japanese travelers. Travel Med Infect Dis. 2009;7(5):296-300.

44. Palk L, Okano JT, Dullie L, Blower S. Travel time to health-care facilities, mode of transportation, and HIV elimination in Malawi: a geospatial modelling analysis. Lancet Glob Health. 2020;8(12):e1555-e64.

45. Vilkman K, Pakkanen SH, Lääveri T, Siikamäki H, Kantele A. Travelers' health problems and behavior: prospective study with post-travel follow-up. BMC Infect Dis. 2016;16:328.

46. Fenner L, Weber R, Steffen R, Schlagenhauf
P. Imported infectious disease and purpose of travel, Switzerland. Emerg Infect Dis. 2007;13(2):217-22.

47. Hagmann SH, Han PV, Stauffer WM, Miller AO, Connor BA, Hale DC, *et al*. Travel-associated disease among US residents visiting US GeoSentinel clinics after return from international travel. Fam Pract. 2014;31(6):678- 87.

48. Han CT, Flaherty G. Profile of Travelers With Preexisting Medical Conditions Attending a Specialist Travel Medicine Clinic in Ireland. J Travel Med. 2015;22(5):312-7.

49. Gautret P, Parola P. Rabies pretravel vaccination. Curr Opin Infect Dis. 2012;25(5):500-6.

50. Gentile A, Paget J, Bellei N, Torres JP, Vazquez C, Laguna-Torres VA, et al. Influenza in Latin America: A report from the Global Influenza Initiative (GII). Vaccine. 2019;37(20):2670-8.

51. Katz MA, Schoub BD, Heraud JM, Breiman RF, Njenga MK, Widdowson M-A. Influenza in Africa: Uncovering the Epidemiology of a Long-Overlooked Disease. The Journal of Infectious Diseases. 2012;206(suppl_1):S1-S4.

52. Yazdanbakhsh M, Kremsner PG. Influenza in Africa. PLoS Med. 2009;6(12):e1000182.

53. Borrow R, Caugant DA, Ceyhan M, Christensen H, Dinleyici EC, Findlow J, et al. Meningococcal disease in the Middle East and Africa: Findings and updates from the Global Meningococcal Initiative. J Infect. 2017;75(1):1-11.

54. Molesworth AM, Cuevas LE, Connor SJ, Morse AP, Thomson MC. Environmental risk and meningitis epidemics in Africa. Emerg Infect Dis. 2003;9(10):1287-93.

55. The influence of education level on choosing coastal regions as tourist ... (n.d.). Retrieved August 15, 2022, from https://www.researchgate.net/publication/319412607_The_influence_of_education_level_on_choosing_coastal_regions_as_tourist_destinations