

# INCIDENCE OF TRAVELER'S DIARRHEA AMONG ADULT FOREIGN TRAVELERS FROM HOSPITAL-BASED DATA, THAILAND: A PROSPECTIVE STUDY

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## ABSTRACT

**B**ackground: Traveler's diarrhea (TD) is a common health problem, and the current incidence of TD in Thailand is yet to be determined.

**Method:** We performed a prospective cohort study to determine the incidence of TD. Adult travelers who had arrived in Thailand within the previous week and volunteered were interviewed their demographic data, travel plans, and health history. Follow-up questionnaires were collected on days 7, 14, and 28 from day of arrival.

**Result:** A total 349 participants met the criteria for analysis. The mean +/- SD age of the participants was 32.3 +/- 10.2 years; 55.58% were male. The cumulative incidences of TD among 349 eligible participants were 13.18%, 22.63%, and 32.37% at 7, 14, and 28 days, respectively. Of 113 participants with TD, 75 consulted a physician, 13 of participants needed to change their travel plans and 2 were hospitalized. Factors significantly associated with increased TD were age (youth), allergy, not routinely washing hands after using the toilet, consuming street food, and having recently visited other South-East Asia (SEA) countries or traveled abroad during the follow-up period. While travel with children or elderly proved to be a protective factor.

**Conclusion:** TD in Thailand was common but occasionally caused a negative impact on travelers.

**Keywords:** TD, foreign travelers, Thailand

## INTRODUCTION

Traveler's diarrhea (TD) has the highest incidence compared to other travel related diseases (Leder K, *et al*, 2013). The term TD in this study, is defined as diarrhea more than or equal to 3 times or Dysentery among international travelers.

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During the past decade, prospective cohort studies of Europeans travelling to South East Asia (SEA) have shown that the incidence of TD has been decreasing, as a result Thailand is presently classified as an intermediate risk country for TD (Dupont HL 2005; Stephen R, *et al*, 2015). However, in the past precise incidence of TD among the international travelers in Thailand has not yet been described. Therefore, the current incidence of TD in Thailand is also yet to be defined.

Previous research into TD in Thailand has focused on the incidence among backpackers from the Khaosan road area, with a mean travel duration of 60 days, which was found to be 30.7%

(Piyaphanee W, *et al*, 2011). The majority of other research has focused on SEA rather than Thailand specifically. One study of the incidence rate in SEA found that 32.05% per 100 person months were effected by TD (Kittittrakul *et al*, 2015). Several prospective studies have also been carried out in Europe. A prospective study among German speaking Europeans who visited SEA found the incidence of TD in first-2 weeks was 17.4% (Pitzurra R, *et al*, 2010). While another prospective study conducted in the Netherlands with the mean travel duration of 23 days to SEA showed the incidence of 41.0% (Soonawala D, *et al*, 2011).

The primary objective of this study is to determine incidence of TD within the first 14 days. This is our primary objective as this incidence rate is used to classify the risk of each country. The secondary objectives are to determine the incidence of TD in first 7 and 28 days as these finding has never been defined. We also plan the associated risks for TD and to describe impact as well as the organisms that might cause TD.

In the past risk factors that were associated with increased in TD were pre-travel diarrhea episodes 4 months before the trip, anti-depressive medication, allergic asthma, TD independent fever, consuming ice and duration of stay (Pitzurra R, *et al*, 2010; Piyaphanee W, *et al*, 2011; Kittittrakul *et al*, 2015). The most common cause reported for TD in SEA is bacteria followed by parasite (Freedman DO, *et al*, 2006).

## MATERIALS AND METHODS

This is a prospective cohort study among adult foreign travelers. The investigator team invited participants who met the inclusion criteria, that is all foreign travelers aged 18 years old and above, who arrived Thailand within a week, to participate. The participants were required to sign a consent form on enrollment. The participants that had diarrhea within 6 hours after arrival to the Kingdom or cannot communicate English were excluded from the study. The enrollment was done from Hospital for Tropical Diseases as

well as Queen Saovabha Memorial Institute. This proposal was approved by the ethical committee of Faculty of Tropical Medicine, Mahidol University, with the approval number MUTM 2016-087-01.

In order to be eligible for enrollment, participants must agree to the interview questionnaire related to diarrhea and allow collection of data about diarrhea on Day 7, 14 and 28 from index date of their visit to Thailand. Data on Day 7, 14 and 28 was collected through online questionnaire [e-mail] or written questionnaire at the clinic. All participants were in the same group.

The sample size calculated was 266 eligible responses. It was calculated using the incidence of 17.4% from previous prospective cohort of TD among European travelers that visited SEA (Pitzurra R, *et al*, 2010). The duration of data collection/subject recruitment was 6 months from December 2016 – May 2017.

A total of 630 participants were enrolled and interviewed with the first questionnaire. A participation rate of 94.4% was observed. A total of 349 participants gave eligible responses through follow-up questionnaire. SPSS program version 23 was used to analyse data. Survival analysis was done by Kaplan-Meier test. The factors were compared using the Log rank test and pooled over strata.

## RESULTS

The mean +/- SD age of the participants was 32.3 +/- 10.2 years. Among them 55.58% were male. Most of the responders were from developed countries. Most of the Asians were from Japan. Australians were from Australia and New Zealand. The North Americans had higher proportion of incidence of TD compared to Europeans and Asians.

The cumulative incidences of TD among 349 eligible participants were 13.18%, 22.63%, and 32.37% at 7, 14, and 28 days, respectively. (Table 1.)

All the participant with general medical problems were included in the group as medical problems. (Table 2.)

**Table 1** Demographic table and association with risks for TD by univariate analysis.

	Total eligible participant [n= 349]	With TD [n= 113]	Without TD [n= 236]	P-value
Age in years, mean $\pm$ SD	32.3 $\pm$ 10.2	30.7 $\pm$ 8.3	33.1 $\pm$ 10.9	0.022
Male sex, N(%)	194(55.6)	65(58)	130(55.6)	0.667
Nationality, N(%)				0.650
African	3(0.9)	1(33.3)	2(66.6)	
European	133(38.3)	39(29.3)	95(71.4)	
North American	139(40.1)	52(37.4)	87(62.6)	
South American	5(1.4)	1(20.0)	4(80.0)	
Asian	54(15.6)	14(25.9)	40(74.1)	
Australian & Oceanian	13(3.7)	4(30.7)	9(69.3)	
Education, N(%)				0.741
Primary school	1(0.3)	0(0)	1(100)	
High school	72(20.5)	26(36.1)	46(63.8)	
University graduate	278(79.2)	89(32.0)	191(68.0)	
Medical problem, N(%)	65(18.7)	24(21.1)	41(17.5)	0.384
Atopy, N(%)	31(8.9)	12(3.5)	19(5.6)	0.429
Allergy, N(%)	58(16.6)	26(8.0)	32(9.9)	0.026

Kaplan-Meier curves that were significantly associated with increase in incidence of TD were among consuming street food and not routinely washing hands after toilet with p-value 0.016 and 0.010 respectively. (Table 3.)

Demographic characteristics of participants that were independently associated with the increase in incidence of TD were younger age and allergy. In allergy to drug, milk or seafood participants the risk is 1.90 times higher than without it. Behaviors such as not routinely washing hands after using the toilet was independently associated with an increased risk of TD by 1.79 times. Travel characteristic of participants were also correlated to incidence of TD, arrival in Thailand from another SEA country or travelling abroad elsewhere during the follow-up period increased incidence by 2.29 times. Interestingly, travel with children or elderly was found to lower chance of TD by 0.32 times. This

might be due to increased precautions against food borne diseases among participants traveling with the vulnerable group.

Of 113 participants with TD, 75 (66.4%) consulted a physician, 13 (11.5%) of participants needed to change their travel plans and 2 were hospitalized. There were 11 participants that were investigated for stool exam and stool culture. Of these, there were 3 parasitic organisms and 2 bacterial infection found. The most common organism found was *B. hominis*. No cause was found in other 6 specimens and these participants were treated empirically with antibiotics and other supportive treatment.

## DISCUSSION

To our knowledge, this is the first prospective study of TD among adult foreign travelers that

**Table 2** Behavior, menu, activities and association with risks for TD by univariate analysis.

Factors	With TD [N = 113] (percentage with TD)	Without TD [N = 236] (percentage without TD)	p-value	OR
Tap water	19(34.0)	31(62.0)	0.359	1.33
Alcohol	87(28.9)	179(67.2)	0.814	1.06
Raw food	49(31.6)	106(68.3)	0.784	0.93
Fruits	102(32.0)	216(67.9)	0.698	0.85
Herbal	37(30.0)	73(66.4)	0.733	1.08
Leftover food	18(26.9)	49(73.1)	0.284	0.72
Do not wash hands				
Before meal	65(34.2)	125(65.7)	0.424	1.20
After toilet	38(42.2)	52(57.7)	0.021	1.79
Ice	97(32.1)	205(67.9)	0.793	0.92
Less than 2meals in hotel	102(31.6)	221(68.4)	0.264	0.62
Street food	103(34.3)	197(65.7)	0.057	2.03
Seafood	67(30.5)	152(69.4)	0.355	0.80
vegetables	85(32.3)	178(67.6)	0.967	0.99
Insect	6(24)	19(76)	0.356	0.64
Bare hands	66(35.1)	122(64.9)	0.239	1.31
Cruise travel	9(45.0)	20(69.0)	0.871	0.93
Swimming	62(31.6)	134(68.4)	0.736	0.93
Trekking	38(35.8)	68(64.1)	0.360	1.25
Travel				
City	111(33.0)	225(67.0)	0.199	2.71
Countryside	93(35.0)	172(64.9)	0.055	1.73
National park	72(36.2)	127(63.8)	0.081	1.50
Arrival from SEA or travel abroad from Thailand during follow-up period	83(39.2)	129(60.8)	<0.001	2.29

traveled to Thailand and it was conducted in Thailand. The subject recruitment was done during the high season for tourism in Thailand, December 2016 – May 2017. In the past, there were two prospective cohort studies among European travelers (Pitzurra R, *et al*, 2010; Soonawala D,

*et al*, 2011). The participation rate of this study is higher than the studies conducted in Switzerland and the Netherlands [94.4% versus 89.2% and 50.2%] respectively (Pitzurra R, *et al*, 2010; Soonawala D, *et al*, 2011). While the response rate of this study was lower than the response

**Table 3** Summarized factors associated with TD by univariate analysis with Odds ratio and 95% confidence interval.

Factors	With TD (n= 113)	Without TD (n= 236)	Odds ratio	95% CI
Age in years, mean $\pm$ SD [Age range = 19 – 71 years]	30.7 $\pm$ 8.3	33.1 $\pm$ 10.9		
Allergy	26 (23.0)	32 (13.6)	1.90	1.07-3.39
Not routinely washing hands after toilet	38 (33.6)	52 (22.0)	1.79	1.09-2.95
Arrival from SEA or travel abroad from Thailand	83 (73.4)	129 (54.7)	2.29	1.40-3.74

rate of the studies conducted in Switzerland and the Netherlands, 55.4% versus 90.3% and 96.1% respectively (Pitzurra R, *et al*, 2010; Soonawala D, *et al*, 2011). In our study, the response rate of the first 2-weeks follow-up was 53.8%.

Comparatively, the incidence of TD during the first 2 weeks of our study is higher than that of previous studies conducted among European travelers to South East Asia [SEA], 22.6% versus 17.4% (Pitzurra R, *et al*, 2010). Whereas, the incidence of TD during the first 4 weeks was found to be lower, 32.4% versus 41.0% (Soonawala D, *et al*, 2011).

As per our study population, all the participants received advice about TD; therefore, we saw lesser impact, such as change in travel plans, among the eligible participants [3.7% versus 11.3%, 8.46% and 8.6%] (Piyaphanee W, *et al*, 2011; Soonawala D, *et al*, 2011; Kittittrakul C, *et al*, 2015). The hospitalization rate was also lower in our study [0.6% versus 3.2%, and 3.6%] but there were more participants that visited medical doctor due to diarrhea [21.5% versus 8.8% and 6.4%] (Piyaphanee W, *et al*, 2011; Kittittrakul C, *et al*, 2015).

In this study, there were no specific types of food that were found to be associated with TD, including factors that have never been studied before; such as eating insects, eating bare hands etc. Factors such as nationality by continent,

education level, purpose of travel, did not show association with TD. This might be due to the majority of participants coming from developed countries, had university level education and came for tourism purposes.

Activities such as swimming, trekking or cruise travel were not significantly associated with TD. For travel destination, factors such as traveling to cities, traveling to countryside or traveling to national parks were not associated with TD.

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