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Risk Factors Associated with Traveler's Diarrhea Among Foreign Travelers in Yogyakarta, Indonesia

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***Abstract*— Traveler's diarrhea (TD) is one of the most common health problem encountered by travelers. TD incidence increases annually especially in developing countries with an average incidence around 20-60% every month. This study was conducted in Yogyakarta because this region's tourism has been growing rapidly, and the information related to TD among foreign travelers in Yogyakarta is still limited. The aim of this study was to determine the prevalence of TD and factor associated with TD. This cross-sectional study was conducted among 150 foreign travelers in March 2018. A self-administrated questionnaire was used to assess characteristics and risk behaviors of participants. The association were determined using chi square test. The result showed that the prevalence of TD among foreign travelers was 20%. The bivariate analysis results were age (OR = 2.45, 95%CI 0.91-6.58, p-value = 0.09), length of stay (OR = 1.44; 95%CI: 0.38-5.42, p-value = 0.737), and risk behaviors consisting of not washing hands before eating food (OR = 1.54; 95%CI: 0.72-3.31, p-value = 0.375), drinking iced beverage (OR = 1.21; 95%CI: 0.64-2.31, p-value = 0.706), and buying food from street vendor (OR = 0.79; 95%CI: 0.40-1.57, p-value = 0.645) respectively. No significant association were noted with any of the variables. The prevalence of TD was slightly high among foreign travelers in Yogyakarta, and despite the evidence from literature, no association between age, length of stay, and risk behavior was found. There is, therefore, a need to provide intervention programs such as health promotion to foreign travelers in order to raise the awareness of TD and to provide hygiene sanitation facilities in tourism place.**

Keywords: traveler's diarrhea, risk factors, Yogyakarta

I. INTRODUCTION

Traveler's diarrhea (TD) is one of the most common health problem among foreign travelers. It is usually related with eating contaminated food and water during trip [1]. The incidence of TD is increasing every year especially in developing country with incidence rate at 20-60% every month [2]. TD is a common disease which affects both individual and group traveler in high risk destination especially in tropical or semitropical region such as South East Asia [3]. It usually affects travelers who visit countries with lower standard of hygiene and sanitation than that of their own [1].

South East Asian country such as Indonesia, Thailand, and Vietnam which are considered as low-middle income country have a higher risk factors compared with high income country [4, 25]. Previous study showed that the prevalence of TD in South East Asian country was 16.14% with the highest prevalence in Vietnam and Indonesia (19%) followed by Lao PDR and The Philippines. On the other hand, Singapore had the lowest prevalence of TD cases [5]. In addition, the total estimation of TD cases in South East Asia region was 30-40% (15-20 million) [6].

Common factors that cause travelers' diarrhea include vulnerable immune system, living in industrialized country, and trip to tropical or semitropical region with poor hygiene and sanitation [3]. Other risk factors of TD comprise age, destination, travelers' origin, length of stay, weather, type of trip, risky eating habit, type of food, and poor hygiene of living place [6]. Around 60% TD cases occurred in international trip is caused by Enteropatogen such as Escherichia coli, Shigella, Campylobacter, Salmonella, and Aeromonas [3]. Besides diarrhea symptoms, people usually also experience nausea, vomiting, abdominal cramps, and fever [1].

TD can induce stress, fatigue and mild pain on travelers as the treatment process can take several days. Moreover, travelers with TD will have difficulty travelling to their desired destination when they have limited period of travel time [6].

The city of Yogyakarta is known as cultural and education center and wonderful tropical city because of the richness of its nature. The number of foreign tourists in Special Region of Yogyakarta Province is increasing from year by year. In 2016, a total of 355,313 foreign tourists visited Yogyakarta. The largest number of tourist were from Netherlands (45,043 tourists), Malaysia (35,777 tourists), and Japan (25,548 tourists) [7].

Meanwhile, the information related to risk factors of TD in Yogyakarta is still limited. The aim of this research is to determine the prevalence of TD and risk factors associated with TD in Yogyakarta based on survey among foreign travelers.

II. METHOD

This study used cross-sectional questionnaire method. Two sampling methods were used for this study. First, a purposive sampling was used to choose tourism place (study location) based on the highest frequency of visitor in Yogyakarta [7] namely Taman Sari, Malioboro Street, and Prawirotaman street. Then, convenience sampling was applied to select participants in accordance with the size of the population to be included in this study.

The necessary sample size was calculated before the study using incidence rate of travelers' diarrhea from a previous study done in foreign travelers visiting Phuket and Chiang Mai. Because incidence rate varied depends on the origin of travelers, we used the previously detected incidence rate of 8% to calculate the sample size [22]. To achieve $\alpha = 0.05$ two tailed, 150 travelers were selected as participant [21].

The inclusion criteria in selecting participants were (a) foreign travelers visiting study location in March 2018, and (b) not under the influence of alcohol. Participants were excluded from this study if (a) they visit Yogyakarta in less than 24 hours, (b) they work in Indonesia, (c) they withdraw from the research, (d) they cannot communicate with the researcher, and (e) they have digestive tract disorders that cause diarrhea.

The questionnaire was adopted from Kittitrakul et al [5] which comprised two parts. First is the characteristic of participant which consists of (a) age and (b) length of stay while the second is risk behavior related to travelers' diarrhea which consists of 3 items scale. Participants were asked how often they committed each of the risk behavior using 5-point likert scale (never to always). Risk behavior was categorized into two groups: risk (often and always) and not risk (never, rarely, sometimes). The questionnaires were written in English and translated into Dutch, Japanese, and Korean.

The quantitative data were analysed using descriptive and inferential statistics. Chi-square test was performed to determine the association between age, length of stay, and risk behavior with traveler's diarrhea. A *p*-value < 0.05 was considered statistically significant. All statistical analysis was conducted using SPSS program for windows.

Ethical approval letter was obtained from the research review committee (ERC) of Ahmad Dahlan University number 011801009. All participants gave informed consent to participate voluntarily in the research. The participants filled out the questionnaire with their present condition and signed it. If they did not understand the point of questionnaire, they were given oral explanation. Additionally, the confidentiality of all the information obtained from each participant were maintained throughout the process of this study. For this study, TD was defined as a passage of three or more loose stools in 24-hour period.

III. RESULTS

In terms of age, most respondents were 24 to 30 years old, and the lowest percentage (2%) was 40 to 48 years old. The minimum age of foreign travelers was 16 years old while the maximum was 72 years old with a mean of 29 years old. Fig. 1 shows the characteristic of foreign travelers in terms of age in Yogyakarta.

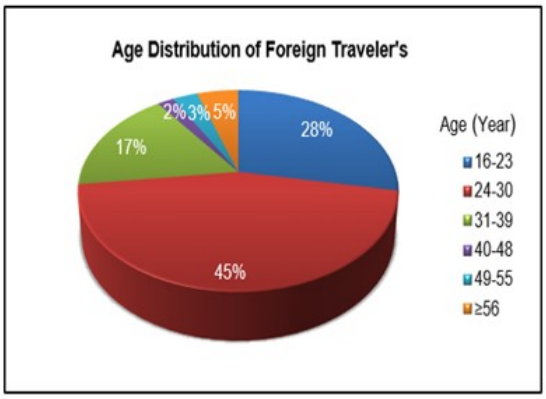

Fig. 1. Foreign Traveler's Distribution by Age in Yogyakarta

In terms of length of stay, 78% foreign travelers stayed around 1 until 3 days. Most of them did short trip in Yogyakarta. Table 1 shows the distribution of foreign travelers' length of stay in Yogyakarta.

TABLE I. FOREIGN TRAVELER'S DISTRIBUTION BY LENGTH OF STAY IN YOGYAKARTA

Length of Stay (day)	n	%
1-3	117	78
4-7	19	13
8-14	12	8
≥15	2	1

[a]Source: Primary Data, 2018

Regarding risk behaviors, 31% reported they did not wash hands before eating food, 31% often drank iced beverages, and 30% sometimes bought food from street vendors. Figure 2 shows the distribution of the risk behaviors.

Fig. 2. Foreign Travelers' Distribution by Risk Behavior in Yogyakarta

Based on the risk category, the age of foreign travelers was 72.7%, and 91% foreign travelers stayed no more than 8 days. In terms of risk behavior, 14% reported that they did not wash hands before eating food, 39.0% drank iced beverages, and 39.0% bought food from street vendor. The descriptive characteristics are presented in Table 2.

The results of bivariate analysis were age (OR = 2.45, 95%CI 0.91-6.58, p-value = 0.090), length of stay (OR = 1.44, 95%CI 0.38-5.43, p-value = 0.737), and risk behavior consisting of not washing hands before eating food (OR = 1.54, 95%CI 0.72-3.31, p-value = 0.375), drinking iced beverages (OR: 1.21, 95%CI: 0.64-2.31, p-value = 0.706) and buying food from street vendor(OR: 0.79, 95%CI: 0.40-1.57, p-value = 0.645) respectively. No significant

association were noted with any of the variables. Table 3 presents the summary.

IV. DISCUSSION

The prevalence of TD among foreign travelers in Yogyakarta were 20% (30 foreign travelers). This finding was higher than that from the previous study which was 13.8% [8]. However, it was lower than the findings in some studies among foreign travelers visiting Thailand (21.3%) [9] and Bali (25.5%) [10].

The risk factors of TD in this study were age, length of stay, and risk behaviors consisting of not washing hands before eating food, drinking iced beverages, and buying food from street vendor. Based on age, 45% foreign travelers were young adult ranging from 24-30 years old. According to the interview, teenage travelers were common in Yogyakarta city. They traveled because of personal interests such as curiosity and were excited to explore the city. Another reason was traveling became their annual routine, especially when their home country got hit by cold weather. Thus they tend to travel to warmer region such as Yogyakarta to avoid the extreme weather. In addition, the average number of group travelers consisted of 2 to 6 people.

TABLE II. DEMOGRAPHIC AND PERSONAL CHARACTERISTIC OF FOREIGN TRAVELERS BY AGE, LENGTH OF STAY AND RISK BEHAVIOR IN YOGYAKARTA

Variable	**n**	**Percentage (%)**
Age		
Risk (≤30years)	109	72.7
Not Risk (>30 years)	41	27.3
Length of Stay		
Risk (<8 day)	136	91.0
Not Risk (≥8 day)	14	9.0
Risk Behavior		
Not washing hands before eating food		
Risk	21	14.0 (often; 9% and always; 5%)
Not Risk	129	86.0
Drink beverages with ice-cubes		
Risk	58	39.0 (often; 31% and always; 8%)
Not Risk	92	61.3
Bought food from a street vendor		
Risk	58	39.0 (often; 29% and always; 10%)
Not Risk	92	61.3

[b]Source: Primary Data, 2018

TABLE III. BIVARIATE ANALYSIS OF VARIABLE AGE, LENGTH OF STAY AND RISK BEHAVIOR WITH TRAVELER'S DIARRHEA IN YOGYAKARTA

Variable	**Traveler's Diarrhea**				**Total**		***OR***	***95% CI***	***P* value**
	Yes		No						
	n	%	N	%	N	%			
Age									
Risk	26	17.3	83	55.3	109	72.7	2.45	0.91-6.58	0.090
Not risk	4	2.7	37	24.7	41	27.3			
Length of Stay									
Risk	28	18.7	108	72.0	136	90.7	1.44	0.38-5.42	0.737
Not Risk	2	1.3	12	8.0	14	9.3			
Risk Behavior									
Not washing hands before eating food									
Risk	6	4.0	15	10.0	21	14.0	1.54	0.72-3.31	0.375
Not Risk	24	16.0	105	70.0	129	86.0			
Drinking iced beverages Risk									
Not Risk	13	9.0	45	30.0	58	39.0	1.21	0.64-2.31	0.706
	17	11.3	75	50.0	92	61.3			
Buying food from street vendor									
Risk	10	7.0	48	32.0	58	39.0	0.79	0.40-1.57	0.645
Not Risk	20	13.3	72	48.0	92	61.3			

[c]*Source: Primary Data, 2018*

The result showed that age was not associated with TD in Yogyakarta. In this study, risk age were defined as teenager until young adult (≤ 30 years old). Contrary with this study, previous finding showed that there was a relation between age and TD p-value < 0.001 [10]. Age played an important role in the occurrence of diarrhea and the risk of other health problems while traveling. Almost all studies showed that teenager and young adults are more prone of getting TD [6, 23].

Teenager and young adult tourists were very enthusiastic and passionate in travelling activities thus exposing them to health problems compared to adult [6]. They also have more consumptive behavior that lead to higher risk of getting diarrhea from Escherichia coli compared with adult [6,11]. By contrast [6], this study found that age ranging from 16-30 years old was not statistically a risk factor of TD. Most studies state that teenager and young adult do not gain much information related to disease that may infect them during travel [8]. However, this study found that 73.3% of participants have obtained the information related to TD. Teenager and young adult have better understanding compared to adult because in this modern era they can easily access reliable sources from their gadget [12]. The interview revealed that 49% teenager and young adult (16-30 years old) knew about TD. Another reason that might support this finding is that the immune system of young adults work normally thus protecting and preventing them from infectious disease caused by fungi, bacteria, viruses, and other organism [13].

The result of this study showed that length of stay was not associated with TD. Most foreign travelers (78%) spent 1 to 3 days traveling in Yogyakarta. Length of stay is considered as risk if travelers spend ≤7 days of travel [6]. This is in accordance with Steffen and colleagues who stated that length of stay is not associated with TD [11]. Another study by Takahashi and Taneepanichskul also found that there was no significant relationship between length of stay and health related problem [8]. Length of stay is one the risk factor of TD [14]. The longer the duration of stay, the greater the risk of developing TD compared to shorter duration because long period of stay in a high risk destination can increase the risk of consuming contaminated food and beverages which caused TD [9,15]. On the other hand, this study found that the longer travelers stay at a destination, the greater the likelihood that they acquire natural immunity against *enteropathogen* [22]. 1-2 weeks period of stay is considered as risky. Nevertheless, it depends on the personal hygiene behavior of traveler and the condition of the destination [6]. Therefore, length of stay is not absolute risk factor. Developing countries are considered as high risk destinations with the incidence of diarrhea at 20-90% per 2 weeks length of stay. Meanwhile, diarrhea cases in low risk destination only reach <8% per 2 weeks length of stay. Destination with incidence rate between >8% and <20% is considered as moderate risk [6].

The increasing risk of TD is also influenced by the travelers' origin. Travelers who are from developing countries are more prone to the risk of exposure due to their immune system that are not used for being exposed to diarrhea (enteropathogenic) bacteria. Moreover, when they are traveling around ≤8 days followed by consuming food from street vendor, they are more likely to get TD [5]. In contrast with this study, some studies in TD among foreign travelers in Bali showed that length of stay is associated with TD occurrence (p-value = <0.001) [10].

The behavior of not washing hands among travelers is influenced by many factors such as knowledge, personal hygiene behavior, and availability of hygiene facility at tourism place. In this study, most of the travelers who came to Yogyakarta understood the importance of washing hand, but the lack of facilities at tourism place hinder them to wash their hands. Thus there were travelers who used personal hand gel sanitizers, or they did not wash their hands at all [16]. The result of this study showed that washing hand was not associated with TD. Not washing hand before eating food put 14% participant in the risk category. Nonetheless, 16% foreign travelers who were not in the risk category still experienced TD. Bacterial infection are not only transmitted by hands but also from other sources such as contaminated food including poisonous, raw (vegetables), and undercooked food [17]. Contrary with this study, another study found that hand washing is associated with TD occurrence (p-value <0,001) [10]. A study by Kittitrakul, et. al, showed that there was association between hand washing behavior and TD occurrence (p-value <0,001) [5].

The current study also found that drinking iced beverage is not associated with TD occurrence. 39.0% (shown in table 3) were categorized into risk category and about 9.0% had TD. Despite that, 11.3% traveler were not in the risk category but still experienced TD. Ice cubes can be medium for *Escherichia coli* that infect human [8]. Previous study about coliform in ice cubes in Malioboro revealed that the amount of *coliform* in dawet (traditional beverage) in Malioboro street was more than 3/g or 3/ml [18] which is beyond the the bacteriological requirements of National Standard Indonesia (SNI) 7388: 2009. In contrast, previous study in Thailand revealed that drinking iced beverages is associated with TD occurrence (p< 0,001) [5,19]. Based on the interview, most respondents bought iced beverage in restaurant or hotel which was more assuring and safe considering the water was boiled.

Buying food from street vendor is not associated with TD incidence. 39.0% were in the risk category and only 6.7% had TD. The results of the interviews revealed that travelers visiting Yogyakarta basically understood the risk of consuming food from street vendor, but most tourists still did this with their own considerations. The considerations included finding very crowded street vendor with local costumer (buyer) and street vendor with adequate sanitary. Supporting this study, previous study about incidence of TD in Bangkok showed that buying food from street vendor was not associated with TD (p-value = 0,171) [19]. By contrast, some researches showed that there was association between buying food from street vendor and TD (p-value < 0,001) [8, 5]. Although eating food purchased from street vendors can enhance cross-cultural experiences, the inappropriate sanitary facilities and poor storage of such food stalls carry an increased risk of travelers' diarrhea [24].

Our study had some limitations. First, there were bias in this survey because we collected data from participants either during their beginning or final trip. The majority of participants were interviewed on their first-third days of trip.

In addition, the report on diarrhea occurrence in this study could be either over or underestimated because the results were based on self-report with minimum sample size. Second, we collected the data from three tourism places in Yogyakarta. Although those three place were chosen based on the highest tourist number, it is not ideal to use data from three places only to assess diarrhea throughout the city. Third, as this is a cross-sectional study, we could not assess the causal relationship between parameters. Finally, due to this study using convenience sampling to recruit the participants, there were some selection bias based on the interviewer.

V. CONCLUSION

There was no association between age, length of stay, and risk behavior with Travelers' Diarrhea among foreign travelers in Yogyakarta. Nevertheless, improving the knowledge of travelers is an important factor to decrease risky behavior and TD occurrence. In addition, it is necessary to provide intervention programs such as health promotion related to TD to foreign travelers in order to raise the awareness and also provide hygiene sanitation facilities in tourism place.

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