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Rukaya Adeola Shittu   Date

Investigating the Impact of Travel Medicine Advice on Risk-Taking Behavior and Travel-

Related Illness

By

Rukaya Adeola Shittu
Master of Public Health

Hubert Department of Global Health

Jessica Fairley, MD, MPH
Committee Chair

_____

Dr. Jessica Fairley
Committee Chair

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By

Rukaya Adeola Shittu

Bachelor of Medicine and Bachelor of Medicine
Igbinedion University
2012

Thesis Committee Chair: Jessica Fairley, MD, MPH

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Abstract

Investigating the Impact of Travel Medicine Advice on Risk-Taking Behavior and Travel-Related Illness

By Rukaya Adeola Shittu

Background: The number of annual international travelers yearly has exceeded one billion in recent years. Much of this growth has involved destinations with increased health risk; yet there are few prospective studies investigating behavioral risk factors among travelers and how much these are associated with travel-related illness.

Objectives: We sought to determine if travel-related illnesses were associated with certain behaviors while traveling and whether pre-travel counseling deters certain risk-taking behaviors.

Methods: A prospective study was carried out at Emory Travel Well Center from June to December 2018, where adult travelers to low or middle-income countries were recruited at the time of pre-travel consultation. Data on travelers' trip details, health and behavior were collected using self-administered questionnaires before and after travel. Medical co-morbidities, vaccines administered, and prescriptions were extracted from the medical charts. Demographic and travel details were described; univariate, bivariate and multivariate analyses performed with Pearson chi-square, Fisher's exact tests and logistic regression to identify factors associated with illness.

Results: We recruited 174 travelers with 110 travelers answering both the pre-travel and post-travel surveys. The median age was 39 years (18, 76); 61% were females. The most common region of travel was Africa (52% of travelers). Twenty-eight (26%) became sick, with diarrhea being the most common. A high proportion of travelers reported eating fresh produce (n=86, 75%), 11% drank tap water, 39% consumed ice, and 19% ate street food. In multivariate analysis, only travel to multiple regions (OR 9.36) (95% CI 1.49 – 58.50) remained statistically significantly associated with travel- related illness.

Conclusions: Travel-related illnesses, especially diarrhea and respiratory illness, were common in this study and falls in line with previously reported studies. The most significant risk factor associated with illness is traveling to multiple regions. Surprisingly, the proportion of unsafe eating and drinking behaviors was high, especially given that the cohort all received anticipatory guidance during their pre-travel consultation. A large sample size will further elucidate the impact of behaviors and travel advice on illness, leading to improved strategies to help travelers remain healthy while overseas.

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Acknowledgments

This thesis would not have been possible without the support of many people. I am thoroughly indebted to Dr. Jessica Fairley, my thesis advisor, whose guidance, advisement, and mentorship have gone far beyond the requirements traditionally asked of an academic advisor and extended into all areas of my life. Her influence on this work, and on my professional development, cannot be overstated. I am also indebted to the staffs of Emory travel clinic for their contributions to this research. I would like to thank my incredible friends, both at Emory University and elsewhere, for their limitless encouragement.

I would be remiss if I did not thank the travelers who participated in this research study, whose response I have done my best to report with honor and fidelity.

Lastly, I would like to thank my family – my parents, and siblings, whose generosity and selflessness I can only hope to emulate in my life.

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Chapter 1: Introduction

Introduction and Rationale

The number of International travelers has continued to experience growth, over the past seven decades (UNWO, 2018). It is estimated that the number of international travelers will reach 1.4 billion by 2020, and 1.8 billion by the year 2030 (UNWO, 2017). The increasing numbers of travelers visiting regions of emerging economies of Asia, Latin America, Central and Eastern Europe, Eastern Mediterranean Europe, the Middle East, and Africa will grow at double the rate (+4.4% a year) of developed economy destinations (+2.2% a year) (UNWO, 2017). As a result, it is projected that international travelers arriving in emerging economies will exceed that of advanced economies by 2020 (UNWO, 2017). In the United States specifically, the number of United states residents traveling overseas in 2017 was approximately 38.33 million (Statistica, 2019).

Due to the increasing numbers of international travelers with majorities visiting low and middle-income countries, the potential for travel-related illness outside their home country and the possibility of getting infected with non-endemic diseases is high. This has become an important issue of concern in public health. It is estimated that about 22 to 64 % of travelers who visited developing countries reported some form of health-related issues ranging from minor viral infections to more severe events like animal bites, severe travelers' diarrhea, malaria infection, and meningitis (Freedman et al., 2006; Fairley, 2017). Since many people do not seek medical attention for minor health issues after travel and since there is no universal database to track all travel-related illnesses, it is hard to determine follow-up with the travel advice routinely during travel, there are significant gaps in knowledge about travelers' health protective or risk-taking behaviors while traveling.

Problem Statement

A growing body of evidence showed that international travelers experience some form of travel-related issues during and after travel as seen in some studies such as a large cohort of American travelers, a study on Swiss travelers whose travel was > or = 90 days and a Geosentinel Surveillance study of illnesses in returned travelers (Hill, 2000; Steffen et al., 1987; Leder et al., 2013). Sixty-four percent of American travelers in a large cohort study reported illness after their travel to developing countries. Diarrhea, respiratory illness, skin disorders, and febrile syndromes were said to be common of which 8% sought medical attention and 26% were ill after return from their trip (Hill, 2000). Also, among the 10,524 Swiss travelers, 15% were reported ill, 8% sought medical care, and 3% were unable to work for approximately 15 days. The illnesses reported were mostly giardiasis, amebiasis, hepatitis, gonorrhea, malaria, helminthiasis (Steffen, et al., 1987). The Geosentinel surveillance study showed that between 2007 and 2011, 42,173 travelers presented to their network of clinics with travel-related illnesses such as gastroenteritis, febrile illness and skin disorders (Leder et al., 2013).

With a growing interest in traveling abroad for the purpose of business, adventure, ecotourism, humanitarian work, family visitation, cheaper health services, travel destination is also getting more diversified to various regions, even regions which were rarely visited. The risk of contracting illness or spread of disease is high among international travelers, thereby increasing the public health burden. For instance, in cases where international travelers return home with infectious disease, they tend to infect people they have contact with, which could eventually lead to an epidemic if immediate intervention is not taken. Also, addressing the significant gap in knowledge and scarce research on traveler's health-protective or risk-taking behavior while

traveling is critical to prevent further health consequences. Anticipatory guidance is at the core

of the pre-travel consult with counseling on how to avoid unsafe food and water, protecting

oneself from insect bites and other preventive measures. Few, if any, studies have investigated

how effectively these interventions prevent adverse health outcomes while traveling, therefore,

this project serves to fill these gaps.

Purpose Statement

The aims of this research study are:

1. To evaluate the frequency of travel-related illness among international travelers (ages 18 and

above) during and after travel. Specifically, we quantified:

    a. The number of travelers that fell sick during and after travel in the study population.

    b. The types of health problems encountered by international travelers.

2. To identify risk factors for illness, such as region of travel, reason for travel, activities, and

risk-taking behavior.

3. To determine if adherence to travel advice is associated with absence of travel-related illness.

Significance Statement

This study will address the significant gap in knowledge about the traveler's health risk-taking

behaviors and an increase in travel-related illness despite the range of available venues for travel

health advice. With the recent growth in the numbers of tourist traveling overseas, tourists are

susceptible to both infectious and non-infectious diseases. Research documenting the knowledge

and attitude of travelers towards travel medicine advice and the risk factors associated with

travel- related illness will provide critical information to improve the health and preventive measures towards international travelers and reduce the public health burden of these diseases.

Also, this project will be one of the first, if not the first, longitudinal studies that will study a cohort of American travelers and thoroughly investigates the impact of travel advice uptake on one's behavior while traveling. And consistent with the Finnish study, it will also investigate risk factors for travel associated illness/conditions. Travel advice is only useful if it is followed. Therefore, by following travelers pre and post travel who present to TravelWell, this study is innovative in that it will evaluate the prevalence of travel-related illness, risk factors associated with it and determine what advice was effective.

Definition of Terms

The United Nations World Tourism Organization (UNTWO) – a United Nations agency responsible for the promotion of responsible, sustainable and universally accessible tourism.

Travel Medicine - a branch of medicine that specializes in health promotion of health; for the peoples, cultures, and environment of regions being visited in addition to prevention of disease or other adverse health outcomes in the international travelers. It focuses primarily on pre-travel preventive care.

International Travelers – Refers to people traveling outside their usual environment for not more than one consecutive year for leisure, business, and other purposes.

Travelers' health – Refers to a state of wellbeing of travelers from illness or injury.

Travelers' diarrhea – Refers to the passage of 3 or more unformed stools per day with 1 or more associated enteric symptoms, such as abdominal pain or cramps, occurring in a traveler after arrival, usually in a resource-limited region.

Travel medicine advice – Refers to topics of health education and advice that should be covered for all travelers includes vaccinations, malaria prophylaxis, prevention of travelers' diarrhea, responsible personal behavior, sexually transmitted disease, and behavior, travel medical insurance.

Travel related illness – An illness or disease to which travelers are susceptible precisely because of their travel.

Chapter 2: Comprehensive Review of the Literature

This Chapter will review the literature regarding the background of travel medicine, international travelers and tourism, travel-related risk, travel-related illness, travelers' health risk profile, travelers' perception of risk, travel medicine consultation, and gaps in knowledge. Also, this chapter will explore the public health implication, and travel health prevention during travel.

Background of Travel Medicine

Travel medicine is a branch of medicine that specializes in diseases and conditions acquired during travel. It creates awareness in travelers who seek medical consultation before travel by discussing the risk of acquiring diseases and injury that are not common in their own country.

Travel medicine falls as far back as hundred or even a thousand years ago when healers or practitioners informed missionaries, explorers, military combatants about the extreme hazards of their occupations. (Keystone et al., 2004). Today, travel medicine focuses on travel related to tourism, business, research, education, ecotourism, humanitarian work, family visitation, and migration and internally displaced people. Travel medicine has grown substantially in the last 2-3 decades and continues to grow and become a critical aspect of medicine that needs continual update.

Jay Keystone et al. stated, "that with the movement of people over centuries of exploration, documentation exists for the spread of diseases such as plagues, yellow fever, malaria, and cholera." However, today travelers not only face disease of decades ago, but also the fear of

acquiring new, and re-emerging illnesses such as Ebola hemorrhagic fever, dengue fever, Lassa fever, Human Monkey pox, H5N1 avian influenza, cryptosporidiosis, vancomycin resistance staphylococcus aureus, typhoid fever, multidrug resistant tuberculosis, HIV, legionellosis, schistosomiasis, rabies, influenza, and meningitis. Others health risks include injuries and exacerbation of underlying illness. Due to these problems in the late 1970s, clinicians started exploring the medical requirements and recommendations that ensures safe travel. (Keystone et al., 2004).

International Travelers and Tourism

Over time, international tourist arrival has snowballed from 25 million globally in 1950 to 278 million in 1980, 674 million in 2000 (UNTWO, 2017). International tourist arrival has sustained growth for the past consecutive years now. In 2017 international tourist reached a total of 1.3 billion, which was 86 million more than in 2016 (UNTWO, 2018). The World Tourism Organization's long-term forecast is expected to reach 1.4 billion by 2020, and 1.8 billion by the year 2030.

According to the World Tourism Organization (UNWTO), the increasing number of international tourists will grow by 43 million per year compared to an average increase of 28 million per year from 1995 to 2010. By region, the most significant growth is expected to occur in Asia and the Pacific, where arrivals are expected to increase by 331 million to 535 million in 2030 (UNTWO, 2017). The Middle East and Africa are expected to double their number of arrivals, from 61 million to 149 million and 50 million to 134 million during this period. Europe is expected to increase from 475 million to 744 million and the Americas from 150 million to 248 million respectively. (UNTWO, 2017). The trend and forecast are shown in the graph below.
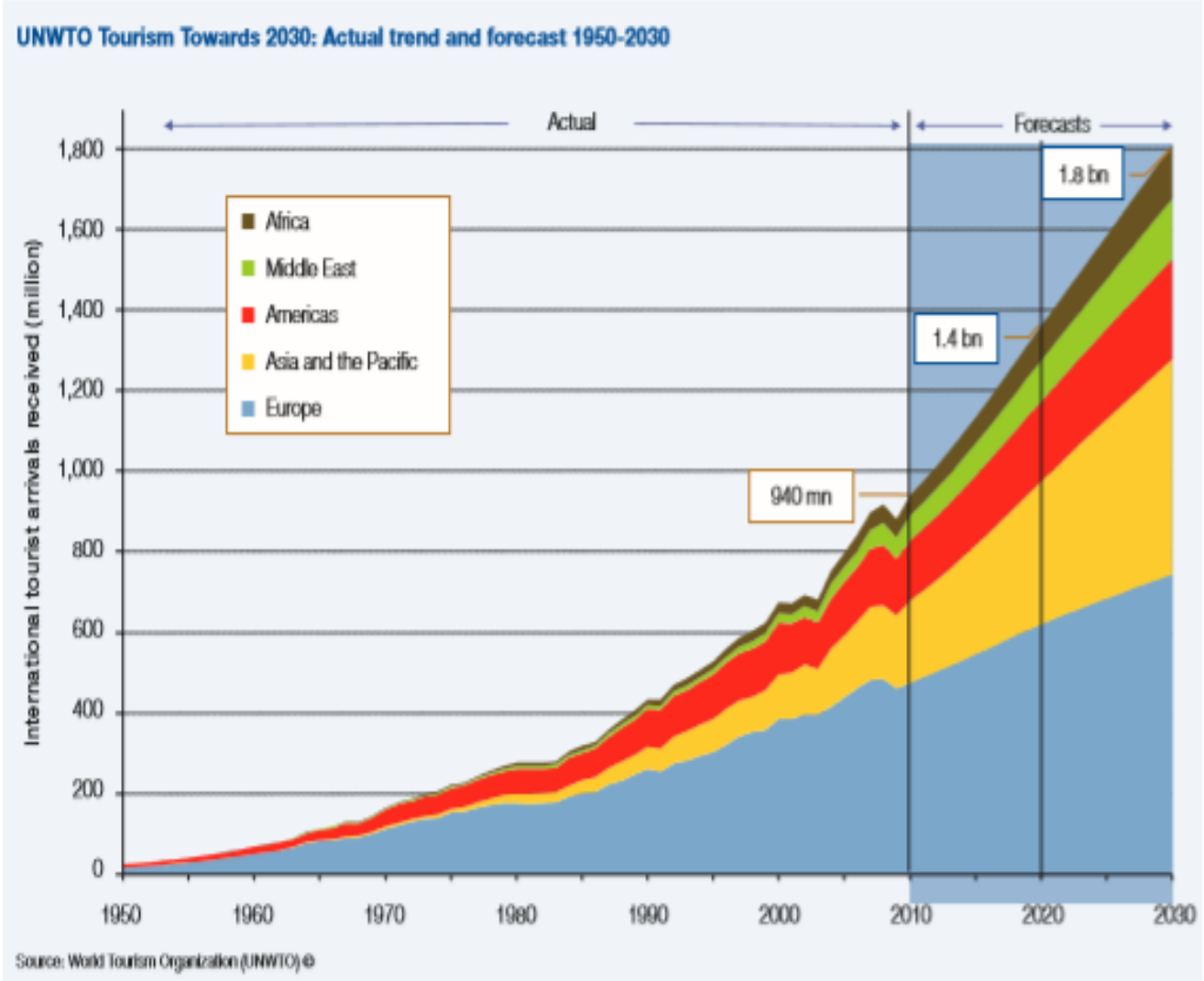
Fig. 1 Description of the graph UNWTO Tourism 2030: Actual Trend and forecast 1950-2030 (UNWTO, 2017)

Travel-related health risks

Depending on the characteristics of the traveler and the type of travel, international travel might expose individuals to various health risks. According to the World Health Organization (WHO), the predisposing factors to consider when assessing the risk of illness are mode of transportation, destination, duration and season of travel, the purpose of travel, type of accommodation, food hygiene and sanitation, behavior of traveler, and underlying health conditions (WHO, 2018). In a study conducted by Jay Keystone et al., they also considered factors which affect travel health risk and they include: the itinerary, duration and season of travel and host characteristics (Jay Keystone et al., 2013). Walker at al. also used a similar terminology in their study, they however included the use of preventive measures (Walker et al., 2017).

Destinations are significant factors when it comes to the risk to which travelers are exposed to. The World Health Organization (WHO) stated that destinations that lack essential medical amenities, reasonable accommodation, proper sanitation, and clean water can expose travelers to serious health risk. Therefore, in these kinds of settings, precautions need to be taken to avoid travel-related illness. Furthermore, the season of travel may also determine if travelers are exposed to certain infectious diseases e.g. if a traveler travels to a meningococcal meningitis belt region around dry and dusty season (December to June), they are at higher risk of getting exposed to meningitis.

Health problems are common among travelers who visit destination with poor socioeconomic status, poor sanitation, the cultural difference between the travelers' country of origin and their destination all contribute to these to health problems. (Abdullah et al., 2000). About 22-64 % of Finnish, Scottish or American travelers were reported to have encountered some health problems during or after their travel with variations depending on the destination and season of travel

(Steffen et al., 2013). Most of these health problems are not severe, usually mild illnesses ranging from diarrhea, respiratory infections, and skin disorders. It is estimated that about 8 percent of more than 50 million travelers to developing countries are ill enough to seek medical care while abroad or after they return. (Steffen et al., 2013; Hill et al., 2000; Freedman et al., 2006).

Based on a systemic PubMed search, Steffen et al, went further on discussing the incidence rate per month of health problems during a stay in developing countries (Fig 2.). Traveler's diarrhea (TD) accounted for 20-60% of the incidence rate of illnesses. This graph also shows the frequency of health problems among travelers. Also, travelers do not always face infectious disease, they can be involved in accidents which could result to death in some cases.
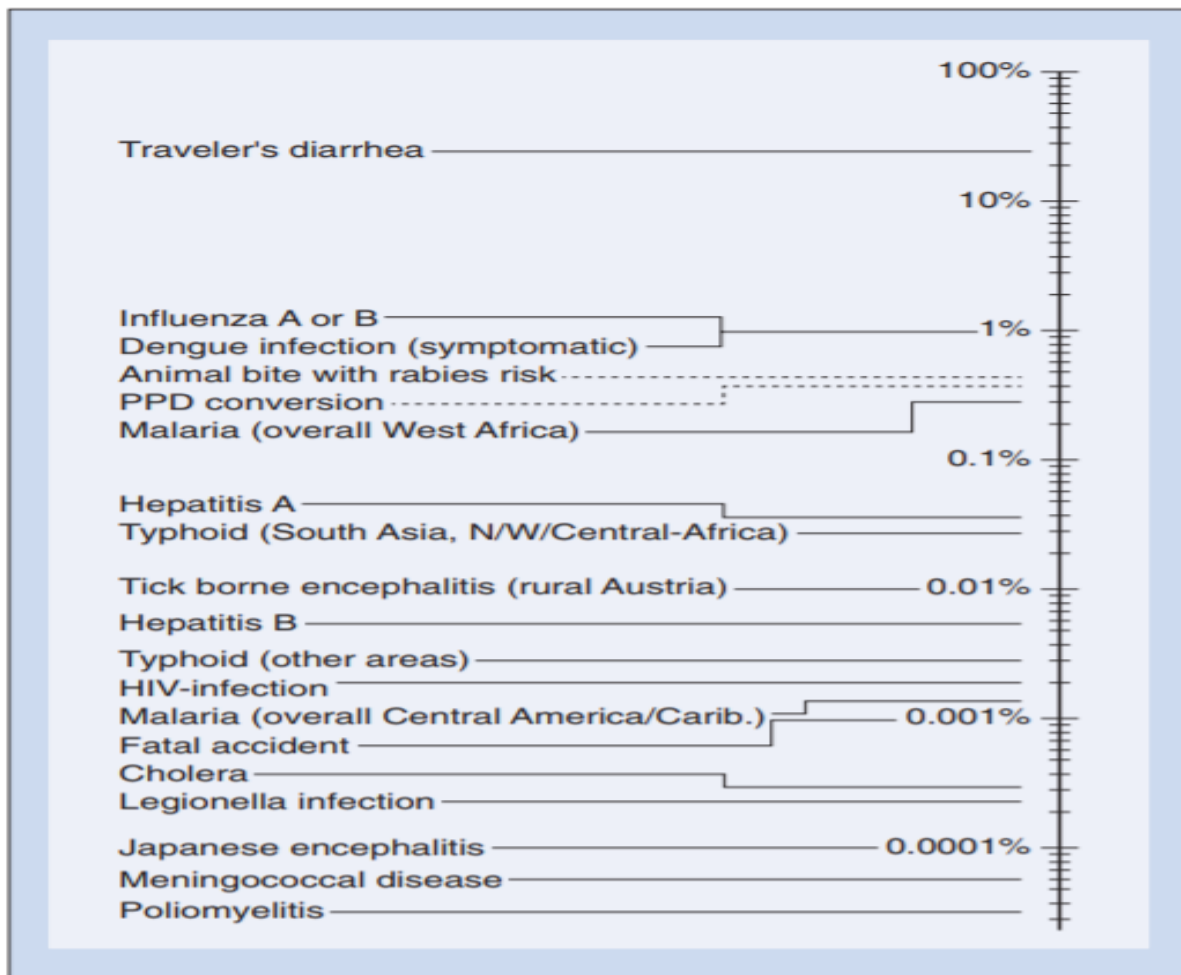
Figure 2.2 Incidence rates/month of health problems during a stay in developing countries - 2011. (Steffen et al., 2011.)

In addition, in evaluating travel-related health risks, it is important to consider the traveler's country of origin, especially when visiting friends and family. This could affect the epidemiology of infectious disease risk but also other social factors which affects health. Migrants who travel to their country of origin are considered to be at higher risk of getting travel- related illness compared to other groups of travelers. A health agency reported in the UK showed a report on migrants' health stating that most of the burden of certain infectious diseases (70% TB, HIV, and Malaria) was from specific populations of people not born in the UK (Coltar et al., 2012). These groups of travelers are at further risk when they go to visit friend or families

in their home country; It was reported that those who visited family and friends, 61% developed malaria and 87% enteric fever (Coltar et al., 2012).

Traveler's diarrhea

Traveler's diarrhea (TD) is one of the most common cause of illness among international travelers. TD occurs in about 20%-60% of travelers visiting low and middle-income countries (Barrett & Brown, 2016; Greenwood et al., 2008). Travelers' diarrhea is defined as the passage of loosed/ watery stools more than three times per day during or after a trip to a developing region. It could also include symptoms such as abdominal pains, nausea, vomiting which are usually acute self-limiting condition and in rare cases life-threatening (Barrett & Brown, 2016).

Several studies have shown that international travelers are susceptible to TD as a result of poor sanitation and hygiene with the change of environment from high to low resource settings (Greenwood et al., 2008; Kendall et al., 2012; Currier et al., 2015; WHO, 2014). Several types of enteric pathogens can cause traveler's diarrhea; such pathogens could either be bacteria, parasites, or viruses (Lindsay et al., 2018; Jiang et al.,2017; Shan et al., 2009). The most common pathogens are bacteria pathogens such as Enterotoxigenic *Escherichia coli* (ETEC), Enteroaggregative *E. coli* (EAEC), *Campylobacter jejuni*, however Shigella species. and Salmonella species has declined among international travelers but contributes to more significant morbidity of post-travel diarrhea (Lindsay et al., 2018; de la Cabada Bauche et al., 2011; Jiang, Z.D et al.,2017; de la Cabada Bauche, J et al., 2011; Jiang, Z et al., 2002; de Saussure et al., 2009; Paredes-Paredes et al., 2011). Parasitic pathogens such as *Giardia lambia* and *Cyclospora catayensis* tend to cause a more persistent diarrhea when related to travel (Barrett et al., 2016;

Sewaminathan et al., 2009). Viral pathogens such as norovirus can cause acute diarrhea among international travelers.

"Two systematic reviews estimated hand washing with soap reduces the risk of diarrheal illness by 30-40%" (Ejemot-Nwadiaro et al, 2015; Freeman et al, 2014). Still, traveler's diarrhea incidence rate is high among international travelers; this shows that there is need for better preventive measures to reduce or prevent the increased rate of diarrheal illness among international travelers. Pre-consultation counseling or other sources of information such as the internet could help mitigate these risks.

Travelers health risk profile

Knowledge, attitudes, and practices are one of the main determinants of traveler's risk profile towards the prevention of travel-related illness. "In KAP studies, knowledge is usually defined as an accurate risk perception, whereas attitude is commonly defined as either intended risk-seeking or risk-avoiding behavior. Finally, practice is defined as the rate of protection against a certain travel-related infectious disease" (van Genderen et al., 2012).

The European Travel Health Advisory Board conducted a cross-sectional study in the year 2002-2003, where a survey was carried out at European airports including the Dutch Schiphol Airport to assess travel health knowledge, attitudes, and practices towards prevention of hepatitis A, hepatitis B, and malaria and to determine the source of pre-travel information among travelers going to developing countries, what information they receive, and preventive travel health measures they adopt (Van Herick et al., 2002; van Genderen et al., 2012). The results of these studies show an important educational need among those traveling to risk destinations.

Risk assessment is another vital part of assessing a traveler's risk profile. It assesses international travelers' risk through the use of travelers' knowledge, age, sex, itinerary, destination, the presence of chronic disease/ underlying conditions, planned activities and preventive measures. This helps classify if a traveler into three types of risk assessment profile; high risk, moderate risk, low risk. Risk assessment helps travel medicine physician's advice travelers on how to reduce the risk of illness and injuries while abroad. Also, allows travelers to make informed decisions and choices regarding preventive measures and interventions while abroad.

Travelers' Perception of Risk

The risk in travel medicine is referred to as harm reduction (this could either be against illness or accidents) during a planned trip. Some risks are avoidable. For instance, when a traveler takes all the recommended vaccinations before embarking on a trip, the risk of infectious disease such as meningitis, hepatitis A and typhoid will be significantly reduced during the trip. On the other hand, other risks may more be difficult to avoid such as car accidents, animal bites and drowning, which accounts for the highest percentage of deaths among travelers than infectious diseases (Steffen et al., 2000).

According to the U.S. the Centers for Disease Control and Prevention (CDC), individual perception and tolerance of risk are subjective and must be considered while counseling travelers. "the subjective sense of risk is based on one's perception of risk (15 per 100,000 means it's dangerous) and one's tolerance for risk (it may be 15 per 100,000, but it's worth it)". The subjective sense of risk has hardly been discussed in the field of travel medicine. As seen in travelers who canceled their trips to Asia due to the fear of H5N1 avian influenza compared to

other travelers who plan to ascend Mount Everest, even though the risk of dying while climbing the mountain is 1 in 40 (Shlim, 2017).

Travel risk cannot be eliminated but can be prevented. This brings about how pre-travel consultation is critical for travelers; it provides updated information to travelers on risks they are likely to encounter and how they can prepare to reduce these risks. This keeps individual to build concepts about risk and benefits of vaccines, prophylaxis and behavioral modification (Shlim, 2017).

With these facts, the role of the travel medicine practitioner should always be on top of their game constantly updating and educating themselves on the various risks associated with different destinations. In effect there is a need to assess individual travelers distinctively, focusing on risk management and not only on risk reduction or avoidance because of the different perception and tolerance of risk (Shlim, 2017).

Travel Medicine Consultation

According to the World Health Organization (WHO), people who intend to travel need to visit travel medicine physician between four to six weeks before their trip. Unfortunately, most travelers do not visit the travel clinic for pre-travel consultations; thereby predisposing at high risk of both infectious and non-infectious disease. The aim of pre-travel consultation is to assess the traveler's travel plans and determine potential health hazard and vaccinate against preventable diseases, medications for prophylaxis and most importantly to educate the travelers' anticipated risk and method of prevention (Chen, 2017). These consultations are typically done in the setting of travel to a low- or middle-income country.

Another study also indicated that a proper travel medicine consultation should be able to provide travelers with accurate, updated advice about health risk, make provision for appropriate vaccines, medications, medical kits, and travel health products (Gheradin, 2007). The author also stated that a brief consultation makes it challenging to map out the risk profile of the traveler; because travel medicine consultation involves a comprehensive risk assessment for individual travelers based on medical history, itinerary, trip duration, accommodation, and other vital information, in order to tailor advice and preventive measures (Gheradin, 2007).

In addition, an excellent travel consultation starts with discussing the positive aspects of travel, not without mentioning the risks and problems while traveling. The travel clinic physician should approach travelers as individual clients, instead of being treated as patients. Taking into consideration that the main aim is compliance, then it is only logical that the traveler is convinced by employing the use of facts rather than a trying to forcefully convince the traveler with dramatic description of negative events (Hatz & Chen, 2013).

The priority of pre-travel consultation is to prevent unnecessary exposures, especially in vulnerable individuals. Therefore, tourists with immunocompromised conditions such as cancer, HIV/AIDS, transplant patients, and other chronic medical conditions need proper attention and stabilization before embarking on a trip to reduce further complications or likewise advice to postpone a trip if their health is unstable. (Hatz & Chen, 2013).

<u>Public Health Implications</u>

With the rapid increase in the numbers of international travelers and with possibly harmful consequences of infectious diseases crossing borders, regions, and continents, can potentially pose a public health threat. An example was seen in 2009; an influenza virus was detected in Mexico, causing illness among the population. Within two months the case of the influenza virus had spread to North America and other countries (Coltar, 2012). This shows how infectious diseases can quickly spread leading to an outbreak or epidemic which can pose a global threat. "Not only are international travelers changing, so are the infections that they acquire" (Moellering, 2010). Moreover, returning from an international trip with an infectious disease not only affect relatives and friends but anyone in contact with the victim, thereby affecting the community at large.

The further public health concern is the emergence of new illnesses (non-infectious health problem) or complications of pre-existing illness while traveling such as exacerbations of cardiovascular conditions (Tonellato, D. J. et al., 2009) or immunosuppressive conditions.

Travelers' health prevention during travel

To be Proactive, Prepared and Protected are prophylactic travel health measures which are critical to both travelers and public health (CDC, 2011). An article on travel health prevention said it is vital for all travelers to have their travel medical kit while embarking on their journey and the medical kit should contain all necessary medications and prevention products; vital medical documents in order to prevent or reduce travel-related illness while abroad. (Korzeniewski, 2017). The travel medical kits should contain essential items such as antibiotics, antidiarrheal, antimalarial, antipyretics, dressing materials, antiseptics, insect repellants, sunscreens; it varies with according to destination and health requirement. Obtaining medical insurance is also essential in case of health emergencies during the trip.

Gap in Knowledge

It is not just the increasing travel to developing economies. There are significant knowledge gaps in our understanding of health problems as a result of travel to developing countries. Health problems may also be influenced by individual risk perception, knowledge, attitude, destination, the reason for travel, etc. Moreover, returning from abroad with an infectious disease might affect relatives, people with close contacts, or the broader community. Applying appropriate guidance on prophylactic travel health measures during pre-travel consultation will benefits individuals and the public health as well.

Societies for travel medicine, national, regional and international, need to incorporate other means of health promotion and better identify the knowledge gaps and needs in order to shape future teaching and research in travel medicine around the globe.

We hope to increase the awareness about the problem, make more data available and stimulate more study in this area. We need to address the needs of each traveler, regardless of where they come from, and regardless of where they are going.

Chapter 3: Manuscript

Investigating the Impact of Travel Medicine Advice on Risk-Taking Behavior and Travel-Related Illness

Rukaya Adeola Shittu[1], Jesse Waggoner[2], Henry M. Wu[2], Jessica K. Fairley[1,2]

[1]Emory Rollins School of Public Health, Atlanta, GA, USA, [2]Emory University School of Medicine, Atlanta, GA, USA

Author for correspondence:

Jessica K. Fairley, MD MPH

Hubert Department of Global Health

Rollins School of Public Health

1518 Clifton Road NE

Atlanta, GA, 30322

Email: Jessica.fairley@emory.edu

Contribution of Student:

The work herein is the product of a secondary data analysis performed by the student. The student had a role in producing the pre-survey questionnaire and the collection of data through survey implementation. The student also performed all work after data collection, including the analysis of the data, the construction of the regression model, summation of results in tables, and all writing. Advisement throughout this process was provided by the student's thesis advisor.

Abstract

Title: Investigating the Impact of Travel Medicine Advice on Risk-Taking Behavior and Travel-Related Illness

Authors: Rukaya Adeola Shittu[1], Jesse Waggoner[2], Henry M. Wu[2], Jessica K. Fairley[1,2]

Background: The number of annual international travelers yearly has exceeded one billion in recent years. Much of this growth has involved destinations with increased health risk; yet there are few prospective studies investigating behavioral risk factors among travelers and how much these are associated with travel-related illness.

Objectives: We sought to determine if travel-related illnesses were associated with certain behaviors while traveling and whether pre-travel counseling deters certain risk-taking behaviors.

Methods: A prospective study was carried out at Emory Travel Well Center from June to December 2018, where adult travelers to low or middle-income countries were recruited at the time of pre-travel consultation. Data on travelers' trip details, health and behavior were collected using self-administered questionnaires before and after travel. Medical co-morbidities, vaccines administered, and prescriptions were extracted from the medical charts. Demographic and travel details were described; univariate, bivariate and multivariate analyses performed with Pearson chi-square, Fisher's exact tests and logistic regression to identify factors associated with illness.

Results: We recruited 174 travelers with 110 travelers answering both the pre-travel and post-travel surveys. The median age was 39 years (18, 76); 61% were females. The most common region of travel was Africa (52% of travelers). Twenty-eight (26%) became sick, with diarrhea (16%) and respiratory illness (9%) being the most common. A high proportion of travelers reported eating fresh produce (n=86, 75%), 11% drank tap water, 39% consumed ice, and 19%

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ate street food. In multivariate analysis, only travel to multiple region (OR 9.36) (95% CI 1.49 – 58.50) remained statistically significantly associated with travel-related illness.

Conclusions: Travel-related illnesses, especially diarrhea and respiratory illness, were common in this study and falls in line with previously reported studies. The most significant risk factor associated with illness is traveling to multiple regions. Surprisingly, the proportion of unsafe eating and drinking behaviors was high, especially given that the cohort all received anticipatory guidance during their pre-travel consultation. A large sample size will further elucidate the impact of behaviors and travel advice on illness, leading to improved strategies to help travelers remain healthy while overseas.

Introduction

The number of international travelers has continued to experience growth, over the past seven decades (UNTWO, 2018). It is estimated that the number of international travelers will reach 1.4 billion by 2020, and 1.8 billion by the year 2030 (UNTWO, 2017). The increasing number of travelers visiting regions of emerging economy of Asia, Latin America, Central and Eastern Europe, Eastern Mediterranean Europe, the Middle East, and Africa will grow at double the rate (+4.4% a year) of travel to developed economy destinations (+2.2% a year) (UNTWO, 2017). As a result, it is projected that international travelers arriving to emerging economies will exceed that of the advanced economy by 2020 (UNTWO, 2017). In the United States specifically, the number of United states residents traveling overseas in 2017 is approximately 38.33 million (Statistica, 2019).

Due to the increasing numbers of international travelers with majority visiting low and middle-income countries, the potential for travel-related illness outside their home country and the possibility of getting infected with non-endemic diseases is high. This has become an important issue of concern in public health because it does not just pose a threat to the individual alone, it's also a public health threat because traveling increases the spread of infectious disease from endemic regions to non-endemic regions. The authors of several studies have reported that about 22 to 64 % of travelers who visited developing countries develop some form of health-related issues ranging from minor viral infections to more severe events like animal bites, severe travelers' diarrhea, malaria infection, meningitis (Freedman et al., 2006; Steffen et al., 2012; Fairley, 2017). This is because many people do not seek medical attention for minor health issues nor follow-up with the travel advice routinely during travel, there are significant gaps in knowledge about travelers' health protective or risk-taking behaviors during and after travel.

Anticipatory guidance is at the core of the pre-travel consult with counseling on how to avoid unsafe food and water or to protect oneself from insect bites, for example. According to the World Health Organization (WHO), people who intend to travel need to visit travel medicine physician between four to six weeks before their trip. The aim of pre-travel consultation is to assess the traveler's travel plans and determine potential health hazard and vaccinate against preventable diseases, medications for prophylaxis and most importantly to educate the travelers' anticipated risk and method of prevention (Chen, 2017).Very few studies have investigated how effectively these interventions prevent adverse health outcomes while traveling, leaving us with the question: does non-adherence to pre-travel counseling increase the risk of travel related illness?

While longitudinal studies of travelers are rare, a study in Finland followed travelers prospectively and found that 79% of travelers were ill on or right after travel, the majority being traveler's diarrhea. The most significant risk factors associated with illness were traveling to Asia and eating uncooked food (Vilkman et al., 2016). This study presented here will be one of the first, if not the first, longitudinal studies that will study a cohort of American travelers and thoroughly investigates the impact of uptake travel advice on one's behavior while traveling. And consistent with the Finnish study, it will also investigate risk factors for travel associated illness/conditions. Travel advice is only effective if it is followed. Therefore, by following travelers before and after travel who present to TravelWell, this study is innovative in that it will evaluate the number of travel-related illness, risk factors associated with it and try to determine what advice was effective.

Methods

Survey design

Between June 2, 2018, and November 30, 2018, we conducted a prospective study among adults

planning on traveling to international countries at the time of pre-travel consultation. A self-

administered pre-travel survey was given to all volunteers at the initial visit, and on return, a

post-travel survey was administered online through an internet based, research compliant survey.

Return and completion of the pre and post survey were completed anonymously.

Setting

The study took place at Emory TravelWell Clinic of Emory Healthcare located in the greater

metropolitan of Atlanta, Georgia. Metropolitan Atlanta has a population of over 5.6 million

people and is the ninth largest metropolitan area in the United States (World Population Review,

2019). Emory Travel Well Center is known for being "Atlanta's premier provider of vaccinations

and health services for international travelers" in the community (Emory Travel Well Center,

2019). At Emory Travel Well Center, physicians and a trained nurse ran consultations by

providing information on travel precautionary measure, checking vaccination history of patients,

and prescribing the appropriate travel vaccines and other travel prescription for a particular

itinerary and addressing any client concern about the trip on which they are about to embark.

Clients who only require vaccinations were seen directly by the travel clinic nurse. The

professional team are all trained in travel medicine and qualified to provide updates on travel-

related health care.

Study Sample

There are about 300 consultations monthly. All adult patients presenting to the travel clinic for pre-travel consultation were eligible for this longitudinal study. The inclusion criteria were adult travelers (>18 years of age), traveling to a low or middle-income country, travel completed within three months from the initial study visit, agreeable to an online or telephone-based survey three weeks after return, signed informed consent. Exclusion criteria were those less than 18 years of age, pregnant or breastfeeding women, and travel to a high-income country only. The design of the study and selection of subjects were approved by the Institutional Review Board (IRB00104300) at Emory University before the study was conducted.

Instruments

Study instruments included two questionnaires which consisted of multiple questions and open-ended questions: One questionnaire (Q1) comprised of 19 and the other questionnaire (Q2) comprised of 31 questions. The questionnaires were pretested for face validity by a panel of 5 physicians with experience in the clinical practice of travel medicine, including infectious disease specialist. The physicians were asked to check if the measurement appears to intuitively measure the construct, revise measurement to check for obvious errors and to avoid interviewer bias. All necessary corrections were made in rephrasing questions in a clear and brief format.

Data Collection

The providers asked all potentially eligible participants if they were interested in participating during their pre-travel consultation. All volunteers who agreed to participate in the study after the pre-travel consultation were seen by the research assistant to obtain informed consent. The volunteers were informed about the self-administered survey, which consisted of two questionnaires: One at the time of their pre-travel consultation and the other three weeks

following their return from travel. The first questionnaire asked about details of their trip including destination(s), duration of travel, the reason for traveling, planned activities, type of accommodations, and planned preventative measures. Other questions included those related to their previous history of travel, medical history, and general knowledge of travelers' health. If a participant declined a recommended vaccine or prescription, we would inquire about the reasons behind this. All participants who completed the pre-travel questionnaires were given a copy of their consent form. Pre-travel data were entered into epi-info and converted into SAS for analysis. The second questionnaire included questions regarding their completed travels such as destinations, accommodation, the purpose of travel, length of stay, itinerary, and completed activities. Also, questions on behaviors such as consumption of street food, fresh vegetable and fruits, ice, fresh produce without peel, drinking of tap water, new sex partners; and questions on symptoms travel-related illness encountered during and after the trip such as diarrhea, respiratory symptoms, fever, abdominal pain. We also asked if they adhered to malaria prophylaxis when prescribed. Post-travel data were collected administered online through an internet based, research compliant survey and converted into SAS for analysis.

Variables

Outcomes: A positive response from participants who developed illness during or after their trip was coded as sick. Participants responses regarding developing illness during or after travel determined if participants were sick or not. Travel-related illness was dichotomous, with getting sick during or after travel coded as 1 and not getting sick during or after travel coded as 0. Subjects who were classified as sick also reported symptoms implying travel-related health illness. According to WHO, Diarrhea is defined as the passage of 3 or more loose or liquid stools per day, or more frequently than is normal for the individual (WHO,2019).

Exposure: Exposure variables included age, sex, destination, accommodation, the reason for the visit and travel behaviors such as consumption of street food, fresh vegetable and fruits, ice, fresh produce without peel, drinking of tap water, new sex partners. The countries visited were grouped into ten geographical regions. South America, Mexico, Central America or Caribbean, West Africa, East Africa, North Africa, Southern Africa, South Asia/Indian Subcontinent, Southeast Asia, East Asia, Pacific Islands, Middle East, Eastern Europe

Data Analysis

Statistical analysis was conducted using SAS (9.4). Descriptive statistics using means, median and frequencies were done first to evaluate the demographic variables and aspects of travel. Univariate, bivariate and multivariate logistic regression model was used to determine potential risk factors (odds ratios) for travel-related illness. The p-value of Pearson Chi-square tests and Fischer's exact test < 0.05 was considered statistically. The logistic regression model was chosen based on the AIC value (130.781). This model had similar or a smaller AIC in comparison to other logistic models, and its adjusted odds ratios and 95% confidence intervals were calculated. Missing data were assumed to be missing at random.

Results

Cohort population and preventive measures

We recruited 174 travelers. 100% completed the pre-travel, and 63.2% completed the post-travel questionnaire with total of 110 travelers filled the online questionnaire after they returned from their journey. Among the travelers, 41% were tourists, 12% were business travelers, 12% were humanitarian workers, 12% were visiting family and friends (VFR), 7% were adventurers, and 5% were researchers. The majority of travelers were female (61%), and 39% of the travelers were between the age range of 18 – 35 years. Seventy percent of the travelers were abroad between one week and a month. (Table 1)

Among the travelers, a total of 112 reported an underlying medical problem, women were more likely to have a medical problem (61%). Sixty-eight percent were prescribed anti-malaria prophylaxis before travel, 90% used malaria prescription as directed. The remaining either forgot to take their medications or did not think there was a risk of malaria.

Travel information and behavior

The 174 travelers visited 10 regions all together; East Africa (53), South America (39), West Africa (19), South Asia (10), Mexico, Central America or Caribbean (9), South Asia/ Indian Subcontinent (7), North Africa (3), East Asia (1), Eastern Europe (1), multiple regions (19). The travelers visited 73 countries altogether with Kenya (37), Tanzania (22), Uganda (20), South Africa (16), Ghana (14), Uganda (14) the most visited countries.

Despite 100% of the travelers getting counseling, some travelers still engaged in behavioral risk: 84 (76%) ate fresh produce, 54(49%) didn't avoid food without a thick peel, 43 (39%) consumed ice, 20(18%) ate street food, 9 (8%) drank tap water, 4(4%) had new sex partners, of which they

all used protection. (Table 2). The most adherent preventive measure was the use of bottled water. Despite 73% saying they wouldn't swim in freshwater (Table 3), 30% did (p= 0.0002).

Travelers risk profiles

To obtain adequate data on destinations of where the 110 travelers who completed the post-travel study traveled (Fig 3), the regions were further subdivided into Africa (n = 56; 52%), Asia (n = 11; 10%), Multiple regions (n = 9; 8%), Others, i.e., South America, Mexico, Eastern Europe (n = 32; 30%). The median duration of travel was 12.5 days for the young adults (ages 18-35) and 14 days for others (age group vs. travel duration $p < 0.001$). The preferred means of accommodation across all age groups was a hotel. Consumption of ice was taken more frequently by adventurers (75%) and tourists (53%) than VFR (30%), researchers (20%), humanitarians (23%) and business travelers (19%) ($p < 0.008$). (Table 4)

Travel-related illness

Of the 28 (26%) that reported being sick. Only 5 (18%) contacted a healthcare provider, with the majority (60%) of those seeking medical attention visiting a clinic when back in the United States. (Table 5) The most common symptom reported was diarrhea (16%), followed by respiratory symptoms (8%). Other symptoms reported were abdominal pain (6%), vomiting (4%), fever (5%), skin rash (1%).

Each geographical region with percent of ill travelers is shown in Fig 4. The percentage of travelers who fell sick was found to be highest among those who traveled to multiple regions. In order to identify aspects of the travel that were associated with travel, a multiple logistic regression was performed using behaviors that may be linked to illness. The covariates in the logistic regression model were travel duration, age, sex, freshwater swimming, drinking tap water, eating street food, using insect repellant, hand washing, and geographical region. Each

covariate was interpreted based on the odds ratio by holding the remaining variables in the model constant. The odds of being sick while abroad increased by 0.5% each day abroad (95% CI: 0.939, 1.077). The odds of being sick while abroad decreased by 52.7% for females relative to males (95% CI: 0.172, 1.301). The odds of being sick while abroad is increased by 40.3% for those who reported swimming in fresh water in comparison to those that did not report swimming in fresh water (95% CI: 0.061, 32.084). However, traveling to multiple regions was the only variable associated with travel-related illness that reached statistical significance (OR: 9.364; 95% CI: 1.499-58.503) (Table 6). Sex, age, accommodation, activities, reason for travel, and duration of travel were not associated with travel-related illness in this study.
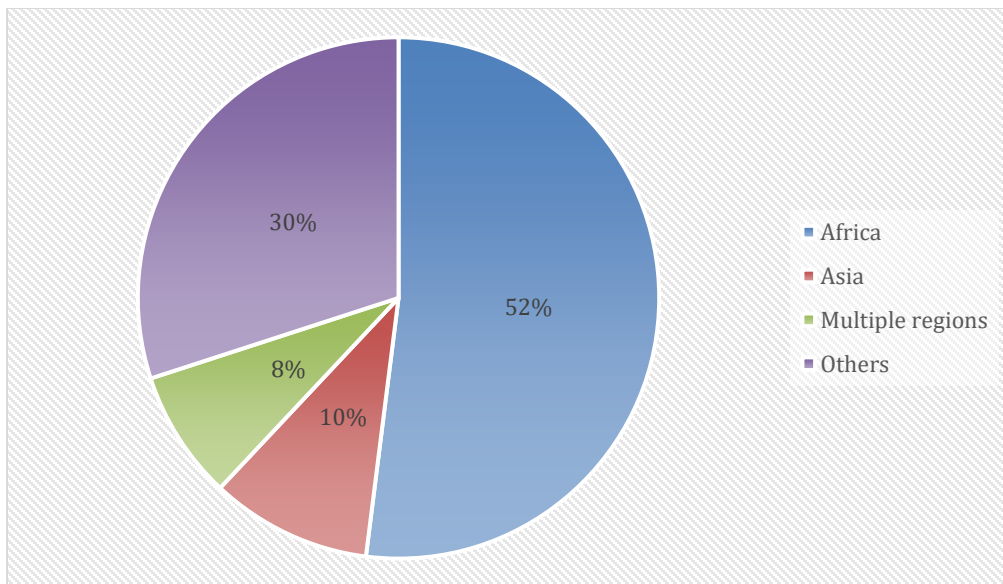
Fig 3. Destination of travel of the 110 travelers that responded the online survey
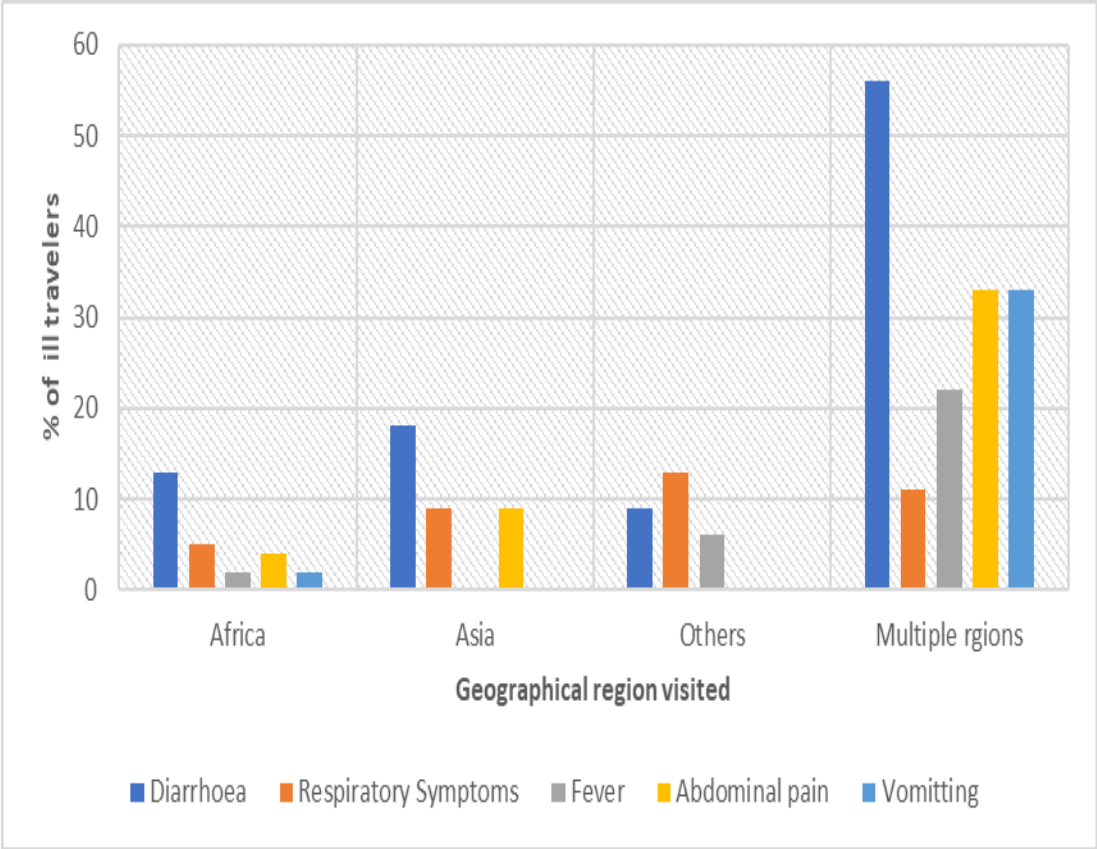
Fig. 4 Distribution of illness among sick travelers across geographical region

Discussion

Investigating traveler's health during and after travel have generally been retrospective and mostly carried out on those seeking medical care after their journeys, whereas prospective studies are scarce. This investigation is one of the first prospective studies that studied a small cohort of American travelers and thoroughly investigated the impact of travel advice on one's risk-taking behavior and travel-related illness. This investigation is similar to study of a large cohort of American travelers (Hill, 2000) and the Finnish study (Siikamaki, 2015), which looked at similar factors in a prospective cohort of travelers. Other studies have investigated the specific effect of certain risk factors on traveler's behavior and travel-related illness; destination (Saleh Abdullahi et al., 2000; Rack et al., 2005; Winer et al.,2002), age (Alon et al., 2010), purpose of travel (Van Genderen et al.,2012), duration of travel (Hill, 2000; Rack, et al., 2005), travel related illness e.g. traveler's diarrhea, fever (Barrett et al., 2016; Greenwood et al., 2008; Kendall et al., 2012; Currier et al., 2015).

In this study, 26% of travelers experienced some travel-related illness during and after their travel. This percent of travel-related illness is lower than the findings from other studies such as; 76% of Finnish travelers; 64% of large cohort of American travelers; 64% of U.K travelers, 70% of Isreali travelers, 49% Swedish travelers (Vilkman et al., 2016; Hill, 2000; Evans ,2001; Winer et al, 2002; Leder et al, 2013). This lower percentage of travel-related illness could be as a result of compliance with the preventive measures given before the travelers embarked on their travel. Travelers who were ill tended to be younger, male, and had a longer duration of travel than those who remained well, although these findings did not reach statistical significance. For all destinations, duration of travel correlated most strongly with risk of illness, with each additional day of travel adding a 0.5% increased risk getting ill while they are abroad for more than 30

days. This increased cumulative risk of illness over time, has been seen in studies of expatriates and long-term travelers (Toovey et al., 2007; Dijkstra et al., 2005) and emphasizes the need for thorough counseling of longer-term travelers. For most, illness was mild, and only a few (5 out 28) travelers sought medical care. Furthermore, multivariate analysis showed that those that went to multiple regions are more likely to fall ill than those that went to a single region, the reason for this could be as a result of multiple risk factors and it's not exactly precise.

Diarrhea and respiratory symptoms, experienced by 16% and 8% of travelers respectively, were the most common complaints both during, and immediately after travel. They were also the most common reasons for which people sought medical care. In previous studies of health overseas, these two illnesses account for the highest percentage of health problems (Hill, 2000; Redman et al., 2006). It was hoped that with uniform pre-travel counseling the incidence of diarrhea would be less. However, this group fared no better than others reported in the literature and indicates that even with careful pre-travel counseling it is challenging to avoid contaminated food and liquids completely.

Comparing the purpose of travel with behavioral risk, we found that those travelers whose reason for travel was for Adventure and tourism engaged more in consumption of ice compared to other travelers. This is possible because both groups have more leisure time to get involved in specific decision, activities to satisfy their experience and they are more exposed to the environment. Those visiting friends and Relatives (VFRs) are a specific group of travelers who have been identified as having an increased risk of travel-related illness as seen in other studies (Seale et al., 2016; Bacaner et al., 2004; Erricson et al., 2006). Contrarily, we did not find that VFRs had more risk behaviors than other groups of travelers in this study. This could be as a result of small number VFRs in this study population.

Interestingly, our study showed that freshwater swimming is protective; this may not be correct, as the response rate of our participant was low; this report may not be accurate. Anti-malaria compliance in this study was 90% and is in line with other studies of international travelers (Vilkman et al., 2016; Hill, 2000). This consistent compliance could be as a result of sufficient preventive advice given during the pre-travel visit.

Our study results also showed that the knowledge gained during the travel consultation depended little on sociodemographic group and travel characteristics. The impact of consultation was different according to the prevention theme addressed; the only pre and post travel preventative measure that was adherent by the study participants was drinking water bottles. Prior to travel 74% of the participants reported that they would not swim in fresh water while abroad. 48% of the participants avoided swimming in fresh water. The differences in the pre-travel intent and actual behavior for swimming in fresh water was statistically significant, showing an area of focus to better counsel travelers.

This study on investigations of the impact of travel advice on risk-taking behavior has some limitations which should be acknowledged. Firstly, the results are not representative of all the international travelers, but of those who participated in the travel clinic survey. Our data would have benefited from a comparison group. Secondly, the large number of variables complicated the statistical calculation for finding a more exact profile from which it could be extrapolated to the whole population who required advice or education; however, these were selected to some extent in order to find a risk profile. Thirdly, the study has a small sample size; as a result, statistical analysis of some subgroups was poorly powered. Fourthly, our data collection for the post- survey, which was collected through survey monkey had limitations; most questions were mostly multiple choice, though it is good for a small survey like our study but the amount of time

it took to digest information was overwhelming. The response rate for the post-survey was low; only 63.2% of the study population responded, despite the reminders by email and phone calls. In this study, we had no records of those that declined participation in the survey. However, based on the number of those recruited by the research assistant and the numbers of those recruited, we estimated that at the maximum 5% of potentially eligible clients declined. However, this study fills a significant gap in existing literature on the impact of travel advice on risk-taking behaviors and travel-related illness and provides more information about US based travelers than other studies.

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Tables

Table 1: Travel Information of 174 travelers recruited at Emory Travel Well Center. The data given below is numbers cases and their proportions

	Number	(%[a])
Sex (missing data=0)		
Male	68	39.08
Female	106	60.92
Age, median (IQR) (missing data= 0)	39 (32-53)	
18-35 years	68	39.08
36-55 years	67	38.51
56 years & above	39	22.41
Medical Problems (missing data = 0)[b]		
Medical problems	62	35.63
No medical problems	112	64.37
Duration of travel, median in days (IQR) (missing data = 0)	12 (8-15)	
1 week or less	33	19.19
1 to 4 weeks	121	70.35
1-3 months	18	10.47
Purpose of travel (missing data= 1)		
Tourism	70	40.46
Visiting Family & Friends	20	11.56
Business	41	23.70
Research	9	5.20
Humanitarian work	21	12.14
Adventure	12	6.94
Accommodation (missing data = 0)		
Hotel	135	78.49
Family	20	11.63
Camping	17	9.88
Geographical region (missing data= 3)[c]		
South America	39	22.81
Mexico, Central America or Caribbean	9	5.26
West Africa	19	11.1
East Africa	53	30.99
North Africa	3	1.75

Southern Africa	10	5.85
South Asia/Indian Subcontinent	7	4.09
Southeast Asia	10	5.85
East Asia	1	0.58
Eastern Europe	1	0.58
Multiple region	19	11.11

[a] Proportion of the participants from whom information was available
[b] Asthma, Hypertension, Diabetes, Cancer, Epilepsy, immune conditions, Allergies, thyroid disorders, Irritable bowel syndrome, Depression or anxiety, osteoporosis
[C] According to primary destination. Further categorized into four subgroups; Africa (West Africa, East Africa, North Africa, Southern Africa), Asia (South Asia/Indian Subcontinent, Southeast Asia, East Asia), Others (South America, Mexico, Central America or Caribbean), Multiple regions (reported traveling to more than 2 regions)

Table 2. Risk factors for getting sick while traveling/ on arrival among 110 travelers[a]. Values are given for proportions of sick travelers with a given risk factor, odds ratio with 95% confidence intervals, and p-values in a bivariable analysis.

	Total[b]	Sick	Sick (%)	Odd ratio	(95% confidence interval)	p-value
Total	110	28	(26)			
Sex						
Male	41	13	32	1		
Female	69	15	22	0.598	0.25 - 1.43	0.248
Age-group						
18-35	42	12	29	1		
36-55	47	13	28	0.956	0.379 - 2.412	0.924
56 & above	21	3	14	0.417	0.103 - 1.679	0.218
Geographical region (missing data= 2)						
Others	32	7	22	1		
Africa	56	13	23	1.080	0.381 - 3.063	1.000
Asia	11	2	18	0.794	0.138 - 4.551	1.000
Multiple region	9	6	67	7.142	1.414 - 36.072	0.018
Duration of travel, days (missing data = 1)						
1-7	20	18	20	1		
8-29	81	74	26	1.400	0.420 - 4.662	0.775[c]
30-100	9	7	22	1.333	0.192 – 9.272	1.000[c]
Purpose of travel						
Tourism						
VFR	47	13	28	1		
Business	10	2	22	0.747	0.137 - 4.076	1.000
Research	27	7	26	0.915	0.313 - 2.674	1.000
education	5	2	40	1.744	0.261 -11.657	0.614
Humanitarian	13	2	14	0.476	0.093 - 2.443	0.485
work	8	2	25	0.872	0.156 - 4.884	1.000
Adventure						
Accommodation						
Hotel	88	21	24	1		

Family	10	3	30	1.367	0.324 - 5.763	0.703
Camping	11	4	33	1.824	0.486 - 6.845	0.462
Recreational activities						
None	36	5	14	1		
Boating/kayaking	22	7	32	0.346	0.0939 - 1.272	0.180
Hiking	36	7	19	0.668	0.1906 - 2.343	0.753
Ocean swimming	16	4	25	2.067	0.4733 - 9.025	0.431
Scuba	2	1	50	6.200	0.3316 - 115.92	0.295
Fresh H2O swim	4	3	75	0.054	0.0046 - 0.625	0.020
Safari	46	12	26	2.188	0.692 - 6.919	0.272
Ate raw fresh vegetables & fruits	84	21	25	0.905	0.334 - 2.453	0.844
Ate fresh produce without peel	56	17	30	1.704	0.711 - 4.081	0.232
Drank Tap water	9	2	22	0.824	0.161- 4.221	0.817
Consumed Ice	43	12	28	1.234	0.516 - 2.949	0.637
Ate Street food	20	7	35	1.770	0.625 - 5.010	0.282
Any animal bites or scratches	1	1	100	>999.999	<0.001 - >999.999	0.989
New sexual partner	4	2	50	3.038	0.407 - 22.664	0.278
Use of protection	4	2	50	3.077	0.413 - 22.948	0.273

[a] Information on those who responded to the survey after travel; 110/174 subjects.
[b] Total number of respondents.
[c] Fischer's exact test used
[d] Others (South America, Mexico, Eastern Europe)

Table 3: Comparing preventive measures planned (on the left column) on taking vs what they did (across top) to answer about risks taken

	Number[c] (%)	**Drank bottle water[b]**	**Avoided street food[b]**	**Used Insect repellant[b]**	**Used Hand sanitizer[b]**	**Avoided Fresh water swimming[b]**
		% p-value	% p-value	% p-value	% p-value	% p-value
Bottle water[a] (missing data = 64)	107 (97)	97 1.0000[*]	_	_	_	_
Avoid street food[a] (missing data = 64)	88 (80%)	_	77 0.1057[*]	_	_	_
Use of insect repellant[a] (missing data = 64)	98 (89%)	_	_	62 0.2161[*]	_	_
Use of Hand sanitizer[a] (missing data = 64)	105 (96%)	_	_	_	89 0.4734[*]	_
Avoid freshwater[a] (missing data = 64)	73 (66%)	_	_	_	_	70 0.0002[*]

[a] Preventive measure planned on taking
[b] What they did
[c] Total number of preventive measures planned on taking
[*]Fischers exact test used.

Table 4. Comparing risk behavior (on the left column) with purpose of travel (on the right column)

	Number (%)	Purpose of travel (%)						
		Tourism	VFR[a]	Business	Research	Humanitarian	Adventure	p-value
Ate raw vegetables and fruits	84 (76)	39 (83)	6 (60)	19 (70)	3 (60)	9 (69)	8 (100)	0.240
Drank tap water	9 (8)	5 (11)	0 (0)	1 (4)	1 (20)	2 (15)	0 (0)	0.47
Consumed ice	43 (39)	25 (53)	3 (30)	5 (19)	1 (20)	3 (23)	6 (75)	0.008*
Ate Street food	20 (19)	8 (17)	1 (10)	2 (7)	2 (40)	3 (23)	4 (50)	0.080
New Sex partner	4 (4)	3 (6)	1(10)	0 (0)	0 (0)	0 (0)	0 (0)	0.707

[a]Visiting friends and relative

Table 6: Symptoms and contacts to healthcare providers. Data are provided for 110 travelers as numbers and percentages for the period during traveling and after travel.

Symptoms	Number (%)[a]
Diarrhea	17(15.45)
Fever	5 (4.55)
Vomiting	4 (3.64)
Abdominal Pain	6 (5.45)
Skin Rash	1 (0.91)
Respiratory Symptoms	9 (8.18)
Insect bite	2 (1.82)
Other symptoms	4(3.64)
Contact with Healthcare[b]	
yes	5 (17.86%)
no	23 (82.14%)

[a] Proportion of those that got sick during and after travel
[b] Proportion of sick travelers that had contact with healthcare

Table 5: Risk factors of contracting illness while traveling and after return in the final multivariable model after backward selection of factors by Akaike information criteria. The covariates in the logistic regression model are duration, age, sex, fresh water swimming, drinking tap water, eating street food, using insect repellant, hand washing, and geographical region. Values are given for proportions with a given risk factor, adjusted odds ratios with 95% confidence intervals and p-values in multivariate analysis.

	aOR	95% CI	p-value
Duration	1.005	0.939-1.077	NS
Age	0.939	0.943-1.018	NS
Sex			
Male	1	NA	NS
Female	0.473	0.172-1.301	NS
Fresh water swimming	1.403	0.061-32.084	NS
Used insect repellant	1.544	0.513-4.648	NS
Hand washing	0.878	0.191-4.038	NS
Geographical region			
Others	1	NA	NS
Africa	1.275	0.390-4.165	NS
Asia	0.961	0.150-6.169	NS
Multiple region	9.364	1.499-58.503	0.0167

Abbreviations: aOR adjusted odds ratios, *CI* confidence interval, *NA* not applicable, *NS* not significant

Chapter 4: Conclusions and Recommendation

This study is among the first prospective study to investigate the impact of travel advice on risk-taking behavior and travel-related illness among travelers. The most significant risk factor associated with illness is traveling to multiple regions. Also, travel-related illness, especially diarrhea and respiratory illness were common in this study and falls in line with previously reported studies. The high proportion of unsafe eating and drinking was alarming especially given that the cohort all received anticipatory guidance during their pre-travel consultation. Incorporating a large sample size will further elucidate the impact of behaviors and travel advice on illness, leading to improved strategies to help travelers remain healthy while overseas.

Due to the increasing number of people that travel yearly, Travel Medicine has now grown and become of a critical aspect of medicine and public health that needs a continual update in both the professional and data collections to help in the prevention of travel-related illness while overseas. In this study, it shows that travelers who travel to multiple regions were the most at risk of getting sick during and after travel. However, more attention needs to be paid to these group as regards to proper tips to stay healthy while abroad and during transit such as use of the disinfectants on trays and armrest before touching them, proper hand washing, constant use of hand sanitizer.

Also, in this study despite all the cohort received anticipatory guidance during pre-travel consultation, a high proportion of unsafe food and drinking behaviors were reported especially among the younger age group and men. Medical advice may not influence risk behavior, and therefore new strategies of health promotion may be needed that places greater emphasis on healthy behaviors and prevention strategies.

Health education is a vital part of reducing travel-related illness among international traveler. Special consideration should be given to dissemination of information via the internet, media, school curriculum, workplaces. Further expansion of services to travel medicine should be supported by state, federal policies and regulations for the safety of the travelers and the masses.

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