

# Review on Emporiatics: A Public Health Perspective on Global Travel

ARCHANA SRIRAMULU<sup>1</sup>, PALLAVI AMMU THOMAS<sup>2</sup>, S VAISHNAVI<sup>3</sup>, SOUNDARYA PRABHAKAR<sup>4</sup>

## ABSTRACT

Emporiatics, or travel medicine, is a multidisciplinary field that caters to the health of travellers by combining relevant healthcare specialisations such as tropical medicine, global epidemiology and immunisation. Due to increased interaction between populations that were previously isolated by geographical boundaries, the cross-country spread of diseases such as dengue, Zika and Coronavirus Disease-2019 (COVID-19) has emerged as a significant health hazard. The present review article discusses the importance of emporiatrics for public health and details how medical tourism and globalisation have contributed to the spread of both infectious and non communicable diseases. It includes a classification of passengers based on their baseline traits, vulnerabilities and intent of travel. Some common travel-related diseases are described, along with their modes of transmission, prevention and treatment. A strong public health foundation is required, in addition to pretravel counselling and awareness-raising, to reduce the health risks associated with international travel.

**Keywords:** Community health, Travel medicine, Travel-related illness

## INTRODUCTION

The field of medical sciences concerned with travellers' health is termed "Emporiatics." The term originates from the Greek words "emperos," meaning traveller and "iatics," meaning medicine. It is otherwise simply known as travel medicine [1]. This interdisciplinary field requires knowledge of the global epidemiology of travellers' health risks, vaccination, aviation medicine, tropical medicine, accident medicine, pretravel counselling and strategies for the management of the sick returned traveller [2].

## SIGNIFICANCE OF EMPORIATRICS

A critical notion that contributes to the increasing need for emporiatrics is globalisation. Globalisation describes the growing interdependence of the world's economies, cultures and populations, brought about by cross-border trade in goods and services, technology and the flows of investment, people and information [3]. The significant reduction in the cost of air travel over the past few years has paved the way for increased travel for leisure activities [4]. Viruses like Dengue Virus (DENV), which were previously confined by natural geographical barriers, are now expanding into non endemic areas, carried by travellers [5]. Infected passengers aboard airplanes have been found responsible for the introduction of dengue, Zika and other viruses into new regions, as well as other contagious diseases like measles, tuberculosis and influenza. In addition, the food served on airplanes has been linked to outbreaks of foodborne infections caused by *Salmonella spp.*, *Staphylococcus aureus*, *Vibrio cholerae*, *Escherichia coli* and others [4].

Indisputable evidence of the effect of globalisation on transborder disease transmission is evident in the recent COVID-19 pandemic, caused by Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV-2) [6].

Another concept to consider is medical tourism. Medical tourism (also called medical travel, health tourism, or global healthcare) refers to the rapidly growing practice of travelling across international borders to seek healthcare services. Services typically sought by travellers include elective procedures, as well as complex surgeries. Medical tourism can be obligatory or elective. Obligatory travel refers to tourists travelling elsewhere to access services that are unavailable or illegal in their place of origin. Elective medical tourism is undertaken when the tourist has access to the service in their place of origin but finds the cost of that service in other countries more

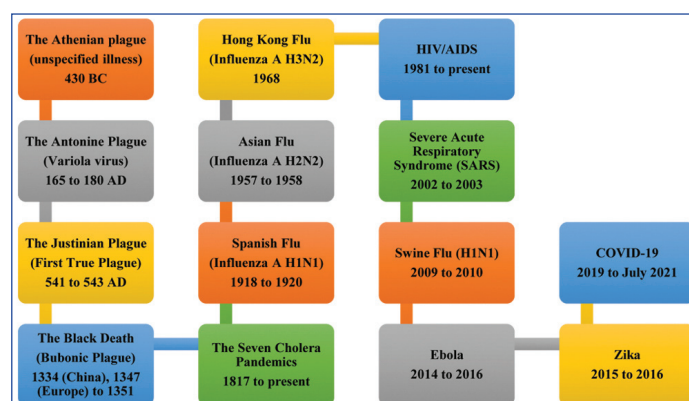
affordable [7]. The treatments for which individuals resort to medical tourism include dental care, stem cell tourism, In-vitro Fertilisation (IVF) treatments, cosmetic surgery, organ transplants and more [7].

## KEY CONCEPTS IN EMPORIATRICS

- Outbreak:** According to the World Health Organisation (WHO), an outbreak is defined by the WHO Eastern Mediterranean Regional Office (EMRO) as the occurrence of cases of disease in excess of what would normally be expected in a defined community, geographical area, or season [8].
- Endemic:** The constant presence of a disease or infectious agent within a given geographic area or population group; this may also refer to the usual prevalence of a specific disease within such an area or group [9].
- Epidemic:** (From the Greek epi meaning "upon" and demos meaning "people") The occurrence in a community or region of cases of an illness, specific health-related behaviour, or other health-related events that are clearly in excess of normal expectancy [9].
- Pandemic:** An epidemic occurring worldwide or over a very wide area, crossing international boundaries and usually affecting a large number of people [9].

## Historical Timeline of Pandemics

Depicted below is a timeline of pandemics that have left a mark in history [Table/Fig-1] [10].



[Table/Fig-1]: A timeline of pandemics throughout history [10].

CLASSIFICATIONS IN THE CONTEXT OF EMPORIATRICS

Classification of Travellers

Mehendale AM et al., (2023) classify travellers as follows:

- 1. Tourism, education, or employment travellers
- 2. Travellers visiting family and friends
- 3. Immigrants visiting family and friends [11].

Shiferaw W et al., (2024) compiled definitions of “traveller” from United Nations World Tourism Organisation (UNWTO), the Centres for Disease Control and Prevention Yellow Book, World Health Organisation International Travel Health, the International Organisation for Migration and United Nations Department of Economic and Social Affairs guidelines and policy documents. They identified different types of travellers [12]. This classification is presented below [Table/Fig-2].

Based on travellers' baseline characteristics	Based on planned travel-related activities	Other travellers	Based on duration of trip
Immunocompromised travellers	Business travellers	Students (medical students abroad, research, gap year, humanitarian aid)	Long-term travellers (i.e., relocation, diaspora and adoption)
Paediatric travellers	Crew members (ship and aircrew)	Forcibly displaced persons (refugees, asylum seekers and displaced people)	
Travellers with underlying disease	Expatriates	Immigrants	
Older travellers	Tourists (tourism, leisure/recreation, visitors, holiday, space and festival) including adventure tourists, backpackers, sex tourists	Migrants (seasonal migrant workers, short-term migrants and migrants)	
Pregnant travellers	Visiting Friends and Relatives (VFR's)	Humanitarian/ volunteer travellers	
Obese travellers	Medical/health tourism	Military	
LGBTQIA+travellers (MSM and LGBT travellers)	Religion (e.g., Hajj, Umrah and Pilgrim's travellers)	Unspecified (traveler, returned, international and last-minute)	

[Table/Fig-2]: Classification of travellers.

Social Stratification and Emporiatrics

There exists a relationship between the income level of a country and its burden of infectious disease [13]. The World Bank provides a classification of countries according to their income level as follows:

- 1. Low-income economies;
- 2. Lower-middle-income economies;
- 3. Upper-middle-income economies;
- 4. High-income economies [14].

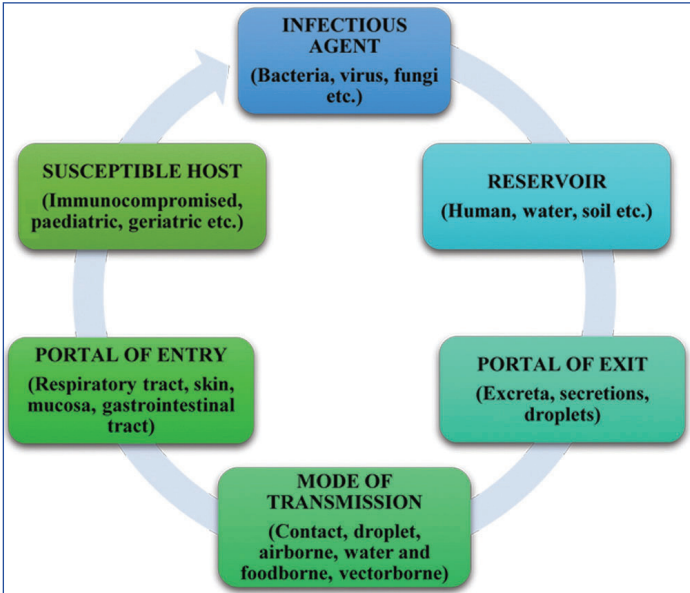
The burden of non communicable diseases is higher in developed countries, while the burden of infectious diseases is greater in developing countries [15]. Hence, travellers should take precautions appropriate to their country of visit. In developing countries, numerous deaths occur due to diarrhoeal diseases, respiratory infections, tuberculosis, malaria, tetanus and others, whereas in developed countries, ischaemic heart disease, cerebrovascular disease, road traffic accidents and cancer are the leading causes of death [15].

COMMON TRAVEL-RELATED DISEASES

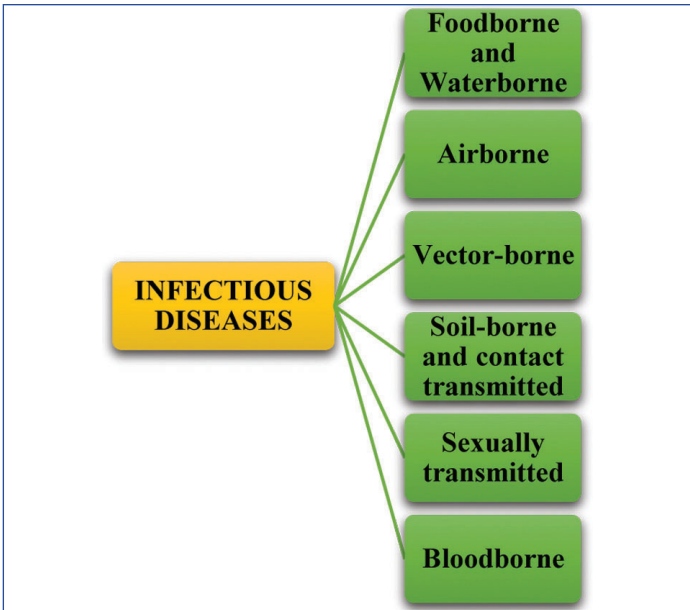
Travellers are vulnerable to infectious diseases prevalent at their destinations and must take necessary precautions to reduce the

risk of infection. Understanding the types of diseases that may be encountered and their modes of transmission is essential for effective prevention. The pathways of transmission of pathogenic diseases are summarised below [Table/Fig-3] [16].

Infectious diseases can be classified based on their mode of transmission, as depicted in [Table/Fig-4].



[Table/Fig-3]: Pathway of disease transmission [16].



[Table/Fig-4]: Modes of transmission of infectious disease.

The causes, modes of transmission, symptoms, areas of prevalence, prevention and management of some common travel-acquired diseases is described in [Table/Fig-5] [17-45].

Population at Risk

- 1. Pregnant and lactating women: Pregnant women are at high risk for venous thromboembolism during long flights. They must take precautions such as frequent ambulation, hydration, calf exercises, wearing compression stockings and taking low-molecular-weight heparin thromboprophylaxis if indicated [46]. Foetal cerebral malarial infection is possible if pregnant women contract malaria [17]. The dengue virus can cause severe haemorrhages and preeclampsia in pregnant women, potentially resulting in foetal abortion or preterm birth. The Zika virus can cause severe foetal malformations [5].
- 2. Immunocompromised patients: Patients with underlying chronic illnesses, such as Human Immunodeficiency Virus (HIV)/Acquired

S. No.	Disease	Pathogen	Mode of transmission	Symptoms	Areas of prevalence	Precautions for travellers	Preventable by vaccination	Incubation period	Management	WHO/CDC guidelines
1	Malaria	Plasmodium species	Mosquito bites (Female Anopheles mosquitoes)	Fever, chills, headache, sweating, fatigue	Sub-Saharan Africa, Southeast Asia, South America	Use mosquito nets and insect repellent and wear protective clothing	Yes (for some strains)	10-15 days	Antimalarial drugs like chloroquine, artemisinin-based therapies	WHO Malaria Guidelines [17]
2	Dengue	Dengue virus	Mosquito bites (Aedes mosquitoes)	Fever, rash, severe headache, muscle pain, joint pain	Africa, the Americas, the Eastern Mediterranean, South-East Asia, Western Pacific	Use mosquito nets and insect repellent and wear protective clothing	No	4-10 days	Symptomatic treatment, hydration, pain relief	WHO Dengue Guidelines [18]
3	Yellow fever	Yellow fever virus	Mosquito bites (Aedes or Haemagogus mosquitoes)	Fever, muscle pain, headache, nausea, vomiting, fatigue	Africa, Central and South America	Vaccination, mosquito protection	Yes	3-6 days	Symptomatic treatment, hydration	WHO Yellow Fever Guidelines [19]
4	Lyme disease	Borrelia burgdorferi	Tick bites (Ixodes species)	Rash (erythema migrans), fever, headache, fatigue	North America, Europe, parts of Asia	Avoid bushy, wooded areas, use picaridin or other repellent, wear protective clothing	No	3-30 days	Check for and remove ticks on the body, take antibiotics as prescribed	CDC Lyme Disease Guidelines [20]
5	Leishmaniasis	Leishmania species	Sandfly bites	Skin lesions, fever, weight loss, enlargement of spleen and liver	Africa, the Americas, the Eastern Mediterranean, Europe and Southeast Asia	Minimise nighttime outdoor activities, use insect repellent	No	2-8 weeks	Amphotericin B, antimonial drugs	WHO Leishmaniasis Guidelines [21]
6	Influenza	Influenza virus	Airborne droplets, direct contact	Fever, cough, sore throat, muscle aches, fatigue	Worldwide, seasonal outbreaks	Hand hygiene, flu vaccination, avoid sick individuals	Yes	1-4 days	Antivirals (oseltamivir, zanamivir)	CDC Influenza Guidelines [22]
7	Tuberculosis	Mycobacterium tuberculosis	Airborne droplets, close contact	Chronic cough, fever, night sweats, weight loss	Worldwide, especially in developing countries	Avoid contact with infected individuals, TB screening	No	2-12 weeks	Antibiotics (rifampicin, isoniazid, pyrazinamide)	WHO Tuberculosis Guidelines [23]
8	Pneumonia	Streptococcus pneumoniae, Haemophilus influenzae, others	Airborne droplets, direct contact	Cough, fever, chest pain, difficulty breathing	Worldwide, high rates in children and elderly	Vaccination, avoid close contact with infected individuals	Yes (for some types)	1-3 days	Antibiotics, oxygen therapy, hydration	CDC Pneumonia Guidelines [24]
9	Swine flu (H1N1)	H1N1 influenza virus	Airborne droplets, direct contact	Fever, cough, sore throat, body aches, fatigue	Worldwide, seasonal outbreaks	Avoid close contact, hygiene, vaccination	Yes	1-4 days	Antiviral medication (oseltamivir)	CDC H1N1 Guidelines [25]
10	COVID-19	SARS-CoV-2	Airborne droplets, direct contact	Fever, cough, difficulty breathing, fatigue	Worldwide	Social distancing, face masks, hand hygiene, vaccination	Yes	2-14 days	Supportive care, antivirals, corticosteroids	WHO COVID-19 Guidelines [26]
11	Typhoid	Salmonella enterica	Contaminated food or water	Fever, abdominal pain, diarrhoea, headache	South Asia, Africa, South America	Drink safe water, avoid raw food, vaccination	Yes	6-30 days	Antibiotics (ciprofloxacin, azithromycin)	WHO Typhoid Guidelines [27]
12	Cholera	Vibrio cholerae	Contaminated food or water	Watery diarrhoea, vomiting, dehydration	Africa, Southeast Asia, Haiti	Drink boiled water, avoid raw food, vaccination	Yes	1-5 days	Oral rehydration therapy, antibiotics (doxycycline)	WHO Cholera Guidelines [28]
13	Giardiasis	Giardia lamblia	Contaminated water, direct contact	Diarrhoea, bloating, gas, nausea, fatigue	Worldwide, especially in developing regions	Boil water, avoid contaminated food, use antiprotozoal drugs	No	1-3 weeks	Metronidazole, tinidazole	CDC Giardiasis Guidelines [29]
14	Schistosomiasis	Schistosoma species	Contact with contaminated freshwater	Abdominal pain, diarrhoea, blood in urine, fatigue	Sub-Saharan Africa, South America, parts of Asia	Avoid freshwater contact in endemic areas, use praziquantel	No	4-6 weeks	Praziquantel	WHO Schistosomiasis Guidelines [30]
15	Toxoplasmosis	Toxoplasma gondii	Ingestion of undercooked meat, contact with cat faeces	Flu-like symptoms, lymphadenopathy, muscle aches	Worldwide	Avoid undercooked meat, wash hands after handling cats	No	1-3 weeks	Antiparasitic drugs (pyrimethamine, sulfadiazine)	CDC Toxoplasmosis Guidelines [31]

16	Filariasis	Wuchereria bancrofti, Brugia malayi	Mosquito bites	Swelling of limbs (elephantiasis), fever, pain	Tropical and subtropical areas, especially in Africa, Southeast Asia	Use mosquito nets, antimalarial drugs	No	6-18 months	Diethylcarbamazine, ivermectin, albendazole	CDC Filariasis Guidelines [32]
17	Rabies	Rabies virus	Bite or scratch from infected animals	Fever, headache, agitation, hydrophobia, paralysis	Worldwide, higher prevalence in Asia, Africa and Latin America	Avoid animal bites, vaccination, post-exposure prophylaxis	Yes (post-exposure)	1-3 months (can vary)	Rabies vaccine and rabies immunoglobulin (post-exposure)	WHO Rabies Guidelines [33]
18	Snake bite	Various venomous snakes	Snake venom through bite	Pain, swelling, tissue necrosis, bleeding, shock	Tropical, subtropical and some temperate regions	Avoid snake habitats, wear boots, use anti-venom	No	Minutes to hours	Antivenom, wound care, pain management, supportive care	<a href="https://www.who.int/health-topics/snakebite#tab=tab_3">https://www.who.int/health-topics/snakebite#tab=tab_3</a> [34]
19	Leptospirosis	Leptospira species	Contact with contaminated water or soil	Fever, headache, muscle aches, jaundice	Tropical and subtropical areas, worldwide	Avoid contact with contaminated water or soil	No	5-14 days	Antibiotics (doxycycline, penicillin)	CDC Leptospirosis Guidelines [35]
20	Plague	Yersinia pestis	Flea bites, direct contact with infected animals or humans	Fever, chills, swollen lymph nodes, sepsis	Sub-Saharan Africa, Asia, parts of the Americas	Avoid flea exposure, use insect repellent	Yes	2-6 days	Antibiotics (streptomycin, gentamicin)	CDC Plague Guidelines [36]
21	HIV	Human Immunodeficiency Virus (HIV)	Sexual contact, blood transfusion, needle sharing, mother-to-child	Weak immune system, fever, swollen lymph nodes, weight loss	Worldwide, higher prevalence in sub-Saharan Africa	Safe sex practices, avoid needle sharing, HIV testing	No	2-4 weeks	Antiretroviral Therapy (ART)	CDC HIV Guidelines [37]
22	Hepatitis B	Hepatitis B virus	Sexual contact, blood, mother-to-child	Jaundice, fatigue, abdominal pain, dark urine	Worldwide, higher prevalence in Asia and sub-Saharan Africa	Vaccination, avoid sharing needles or personal items	Yes	1-6 months	Antiviral medications, liver transplant in severe cases	<a href="https://www.cdc.gov/hepatitis-b/index.html">https://www.cdc.gov/hepatitis-b/index.html</a> [38]
23	HPV	Human papillomavirus	Sexual contact, skin-to-skin contact	Genital warts, cervical cancer, throat cancer	Worldwide	Vaccination, safe sex practices	Yes	3 weeks to 8 months	Wart removal, cervical screening, HPV vaccination	<a href="https://www.cdc.gov/hpv/about/">https://www.cdc.gov/hpv/about/</a> [39]
24	Syphilis	Treponema pallidum	Sexual contact, mother-to-child, blood transfusion	Chancre (painless sore), skin rash, fever, swollen lymph nodes	Worldwide, higher prevalence in Africa and Latin America	Safe sex practices, syphilis screening	No	10-90 days	Antibiotics (penicillin)	CDC Syphilis Guidelines [40]
25	Ebola	Ebolavirus	Direct contact with infected bodily fluids or tissues	Fever, vomiting, diarrhoea, bleeding	West and Central Africa	Avoid contact with infected individuals, use PPE	No	2-21 days	Supportive care, experimental treatments (e.g., monoclonal antibodies)	<a href="https://www.who.int/news-room/fact-sheets/detail/ebola-virus-disease">https://www.who.int/news-room/fact-sheets/detail/ebola-virus-disease</a> [41]
26	Zika	Zika virus	Mosquito bites (Aedes species), sexual contact, mother-to-child	Fever, rash, joint pain, conjunctivitis, birth defects in newborns	Tropical and subtropical areas worldwide	Use mosquito repellents, safe sex practices	No	3-14 days	Supportive care, prevention of pregnancy for at-risk women	CDC Zika Guidelines [42]
27	Tetanus	Clostridium tetani	Contamination of open wound with spores from soil	Muscle spasms, lockjaw, difficulty swallowing, fever	Worldwide, higher risk in rural areas	Wound cleaning, vaccination (tetanus shot)	Yes	3-21 days	Antitoxin, antibiotics (metronidazole, penicillin), muscle relaxants	CDC Tetanus Guidelines [43]
28	Conjunctivitis	Various pathogens	Direct contact with infected fluids, airborne droplets	Red, itchy eyes, discharge, swollen eyelids	Worldwide	Avoid touching eyes, practice good hygiene	No	1-3 days	Antibiotic eye drops for bacterial form	CDC Conjunctivitis Guidelines [44]
29	Necrotising fasciitis	Various bacteria	Direct contact with infected tissue	Severe pain, fever, swelling, skin discolouration	Worldwide	Proper wound care, timely medical attention	No	1-4 days	Surgery, intravenous antibiotics (meropenem, vancomycin)	<a href="https://www.cdc.gov/group-a-strep/about/necrotising-fasciitis.html">https://www.cdc.gov/group-a-strep/about/necrotising-fasciitis.html</a> [45]

**[Table/Fig-5]:** Some common travel-acquired diseases [17-45].

Immunodeficiency Syndrome (AIDS), are more prone to infections. They are advised to have pretravel evaluations, avoid animals and vectors, refrain from consuming uncooked food, drink purified water, limit skin exposure and wear protective clothing [11].

- Paediatric and geriatric age groups: Travellers from extreme age groups may have a deficient immune system. They are advised

to seek pretravel counselling, receive necessary vaccinations and follow general food and hygiene precautions [47].

### Emergencies in Emporiatrics

Travellers should be prepared to respond appropriately in case of an emergency. It is recommended to have a reliable emergency



contact and to share your itinerary and location with them. Carrying whistles or alarms for personal safety is advisable, as is being aware of the locations of nearby hospitals and police stations in advance. Travellers should avoid accepting drinks from strangers to mitigate the risk of being unknowingly drugged. Additionally, travellers should be prepared to handle medical emergencies. Carry medications as prescribed by your healthcare provider, ensure you have antiallergic medicines readily available and consider wearing a MedicAlert bracelet if you have serious medical conditions. These practices can help ensure personal safety and preparedness while travelling [47].

Travellers are encouraged to equip themselves with knowledge of basic first aid. A travel first aid kit should contain prescription medications, analgesics, oral rehydration salts, antacids, antibiotics, insect repellents, a thermometer, plasters, gauze bandages, scissors and tweezers [48].

### Travel Insurance

The CDC provides guidelines for travel insurance, outlining its necessity and types of coverage. There are many insurance providers available and it is wise to consider medical evacuation insurance before travelling to high-risk areas. This will ensure the affordable transfer of the traveller from remote regions to high-quality hospitals if required [49]. First aid for emergencies during air travel can be provided by trained crew members equipped with emergency medical supplies on board [48].

### General Travel Precautions: A Note for Travellers and Healthcare Providers

Travellers must be aware of the precautions and actions to be taken while travelling to high-risk areas. They should meet with their healthcare provider well before their trip to receive destination-specific vaccines, learn how to manage special conditions such as pregnancy, allergies, or other health issues and carry appropriate medication and a first aid kit [48]. Precautions and management for specific diseases are detailed in [Table/Fig-5].

Healthcare providers should be able to counsel their patients before travel or refer them to a travel clinic. Responsibilities of the healthcare provider include risk assessment, recommending appropriate dietary precautions, providing relevant vaccinations, educating the patient about the prevention of vector-borne diseases and informing the patient about activities that may be potentially dangerous for their health condition [50].

## DISCUSSION

Emporiatrics is an interdisciplinary field that integrates epidemiology, preventive medicine and global health systems to protect visitors and the communities they visit [11]. This approach helps to address important public health issues. The dangers of cross-border disease transmission have increased dramatically due to the rise in international travel brought on by economic expansion, globalisation and falling transportation costs. This dynamic was most clearly demonstrated during the COVID-19 pandemic, when travel abroad contributed to the virus's rapid dissemination throughout the world [6].

From a public health perspective, knowledge of global disease patterns and populations at risk plays a key role in protecting the health of travellers and the health of indigenous communities who may be exposed to disease by foreign carriers [11]. Non communicable diseases such as cardiovascular diseases and injuries due to accidents contribute significantly to mortality. Emporiatrics considers the individual's risk factors, which could be exacerbated by travelling and educates the traveller on precautions to take for a safe journey [47].

Pretravel counselling, vaccination programmes and health education have become available to travellers to ensure their safety [2]. The WHO and CDC provide comprehensive guidelines for travellers based on their risk factors, travel destination and the diseases

prevalent in the respective areas. Emporiatrics further emphasises the necessity of equitable health interventions, particularly for vulnerable populations such as immunocompromised individuals, pregnant women, children and elderly travellers. These groups face unique health risks during international travel, necessitating tailored recommendations and interventions [47].

In this regard, emporiatrics plays a crucial role in public health by encouraging pre-trip consultations, vaccination campaigns and increased knowledge to lessen the risk of illness for travellers.

## CONCLUSION(S)

The field of emporiatrics is becoming increasingly relevant as population migration and globalisation contribute to complex health issues. Preventive measures, health education and interdisciplinary cooperation are necessary to protect the health and welfare of both tourists and indigenous communities. Modern public health practice must take into account the role of emporiatrics in curbing the spread of disease across borders. Knowledge of travel medicine is essential for travellers and healthcare personnel alike. Further advancements in emporiatrics must be initiated by utilising technological tools such as predictive analytics and digital health surveillance. The health hazards of international travel can be effectively reduced by incorporating public health initiatives and clinical interventions.

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# PARTICULARS OF CONTRIBUTORS:

1. BDS Intern, Department of Public Health Dentistry, Tagore Dental College and Hospital, Chennai, Tamil Nadu, India.
2. Senior Lecturer, Department of Public Health Dentistry, Tagore Dental College and Hospital, Chennai, Tamil Nadu, India.
3. Reader and Head, Department of Public Health Dentistry, Tagore Dental College and Hospital, Chennai, Tamil Nadu, India.
4. Senior Lecturer, Department of Public Health Dentistry, Tagore Dental College and Hospital, Chennai, Tamil Nadu, India.

# NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Pallavi Ammu Thomas,  
Senior Lecturer, Department of Public Health Dentistry, Tagore Dental College and Hospital, Rathinamangalam, Melakkottaiyur Post, Chennai-600127, Tamil Nadu, India.  
E-mail: [drarchanasriramulu@gmail.com](mailto:drarchanasriramulu@gmail.com)

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