SYSTEMIC REVIEW: SPREADING OF ORGANISMS THROUGH MEDICAL TOURISM AND ITS BURDEN

SYSTEMIC REVIEW: SPREADING OF ORGANISMS THROUGH MEDICAL TOURISM AND ITS BURDEN

BY

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TITLE: SPREADING OF ORGANISMS THROUGH MEDICAL TOURISM AND ITS BURDEN

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Abstract:

In the pinnacle of modern technology and globalization, when overseas travel is readily available and online health care access is just a click away, medical tourism is hot topic both from a national and global health perspective. Healthcare travel abroad has increased rapidly; interventions include organ transplant; cardiac surgery; reproductive care; and joint, cosmetic, and dental procedures. Individuals who receive medical care abroad are vulnerable, sentinel populations who sample the local environment and carry home unusual and resistant infections, documented in many reports. This review mainly selected all the relevant articles that study patients after they have returned home. All types of evaluative study designs have been considered as inclusion criteria. Medical tourists are at risk for hospital-associated and procedure-related diseases as well as for locally endemic infections. Patients may not volunteer details about care abroad, so clinicians must inquire about medical procedures abroad as well as recent travel. Special infection control measures may be warranted. Healthcare abroad is associated with diverse financial, legal, ethical, and health-related issues. We focused on reasons for seeking medical attention and problems the infectious disease clinician may encounter and provide a framework for evaluating returned medical tourists with suspected infections. A better system is needed to ensure broad access to high-quality health services, continuity of care, and surveillance for complications.

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List of Abbreviations

MTm - Medical tourism

MTs - Medical tourists

ESBL - Extended-spectrum β-lactamase

CRE - Carbapenem-resistant Enterobacteriaceae

MRSA - Methicillin-resistant *Staphylococcus aureus*

IAI –Intra-abdominal infection;

NS - Not stated.

DGF - Delayed graft function;

UTI - Urinary tract infection.

WHO – World Health Organization

RGM - Rapidly growing Mycobacterium

NTM– Non-tuberculous mycobacteria

Background

In recent times, we are experiencing substantial and dramatic globalization in many fields, remarkably in healthcare. In the past, people have minimal opportunities to get access to those facilities unavailable at home. Once the idea of the global village was imagination, but now it has come to a reality. People are getting closer though the globe size remains the same. They are traveling from one corner to another corner because of the development of the communication system drastically. International air flight has been increased exponentially. During 2011 international flights have been taken by around 1 million passengers. Once the intercontinental journey was weeks or months distance now, it has become a matter of hours. The everyday physician receives a patient from various corners of the globe. These emerging numbers of people seeking medical attention or surgical interventions are defined as the "intercountry" population. This group of people comprises both military and civilian aeromedical evacuees and medical tourists. Nowadays, traveling for medical purposes from developed countries to middle-income countries has increased tremendously to avoid the expensive cost and unavoidable delay." Medical tourism" or "cross border health care "refers to travel to another country because of medical treatment or seeking medical attention (Heible M, 2011 & Milstein A., Smith M. 2006). Another group of people close to medical tourists is well known as an informal medical tourist. They are also defined as "diaspora." Those are mainly expatriated people from different nations. Currently, "diaspora" is denoting the thriving group from India and Pakistan. The number of people is significant, around 24 million from India and 7 million from Pakistan. They have strong familial and cultural bonding and liaise with their family, friends, and relatives through return travel.

Health tourism consists of two things: Wellness tourism and medical tourism. Wellness tourism refers to promoting health and well-being by traveling through various activities including physical, psychological and spiritual. This paper is designed mainly to highlight medical tourism. It is a multibillion-dollar phenomenon and can boost up a

country's economy by creating jobs, earning foreign remittance, etc. The most visiting countries for medical tourism are lower-middle-income countries with few developed countries. Notably, destinations include India, Mexico, China, Latin America, Singapore, Pakistan, Middle East countries and Europe (Horowitz MD, Rosensweig JA, Jones CA et. al., 2007). Common destinations from South Asian nations are Singapore & Malaysia, and the percentage is about 70%. In contrast, patients from the Caribbean and Central America are going to Cuba and from Middle East countries to Jordan {4}. The recent boom of this service in developing countries has got attention. From 2005 to 2015 growth of this sector is $20 to 140 billion globally. In 2016 out of 11million medical tourist, 1.4 million were Americans who traveled for surgical interventions. The Government of India reported that in 2017, on M-Visa, inbound medical tourists (MTs) traveled to India for knee transplant, cosmetic surgery and dental from six developing countries – Bangladesh (221,751), Afghanistan (55,681), Iraq (47,640), Maldives (45,355), Oman (28,157), Yemen (11,903) and Seychelles (939). There was a marginal increase in MTs from developed countries from 2015 to 2017 – the USA (615–649), the UK (609–755), France (56–97) and Germany (52–109), (IMTJ, 2018). Many of the skilled physicians treating the medical tourist trained in the US or the UK because many medical schools are collaborating with foreign medical institutions to produce a good number of efficient and skillful physicians. Besides other crucial factors like cheap labour, lower cost of services, human resources availability provides a big platform and substantial cost advantages to developing countries to offer overseas tourists (Smith RD, Chanda R et, al., 2009).

Until now, accurate medical tourism data is not well stored and sorted, and there is no specific and complete data set which includes the volume of patients, services, destinations, and procedures. Inappropriate reporting systems and inconsistent data fail to produce medical tourism's real scenario and put it under nebulosity. Information from various sources shows some differences. According to one source, it is estimated that 4 million patients travel overseas to receive treatment, whereas Thailand alone received million by 2005(Smith RD, Chanda R, 2009) and India, Malaysia and Singapore

reached this figure by 2012 (Smith RD, Chanda R, 2009). The Asian market produced $4.8 billion in 2012 by offering health services. Upon patients' response and a considerable influx of international patients, Singapore had taken some initiatives to develop some new areas like stem cell treatment and transplant, where most of the developed countries are still struggling to provide this service. The new guideline has been published recently for medical tourism to monitor everything and get the record.

Another debatable source stated that in 2007 for medical procedures, around 750000 Americans traveled overseas, where 45% of them went to Asia (Kumar S, Breuing R, Chahal R et. al., 2012). In 2005 a vast number of Americans approximately 55000 received medical treatment in Bangkok at Bumrungrad Hospital. Moreover, every year this hospital treats 420000 international patients. (Bumrungrad International Hospital Fact sheet).

Receiving treatment from abroad is becoming more popular, and people are inclining towards it because some interventions in medical fields added a new dimension in this service, including organ transplant, reproductive care, cosmetic surgery and cardiac surgery, joint and dental procedure. Medical tourism involves two activities; travel and hospital procedures that are more likely to spread infection, especially immune suppressed or compromised travel to and from the endemic area. Many reports show that people receiving treatment from abroad are prone to carry and spread the unusual and resistant infections. Some of the organisms playing a crucial role for nosocomial and community-acquired diseases, most notably E.Coli and Klebsiella pneumoniae (Bumrungrad International Hospital Fact sheet).

The increasing tendency of seeking expert opinion from overseas physicians has led to an outbreak of many organisms, including MDR in the areas which are non-endemic to those species. "Multi-drug-resistant Gram-negative bacteria, including MBL-producing Pseudomonas aeruginosa, extended-spectrum beta-lactamase, and carbapenemase-producing Enterobacteriaceae and multi-drug resistant Acinetobacter baumannii, have been circulating the globe in recent years" (Shmuel Benenson, Ran Nir-Paz, et,

al,.2018). As beta-lactam is considered a mainstay of treatment to this serious infection caused by Enterobacteriaceae, resistance to this group of the drug will create a formidable challenge to treat these infections.

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Currently, we are facing lots of devastating health issues, while many of them are unrecognized. My objective of this review is covering the uncovered areas of previous literature, including organism spreading through MTm, reasons of inclination towards it, and challenges and global impact of it. We firmly believe this will generate valuable information and help mitigate the spread of infection and take appropriate initiatives.

Method:

Relevant studies will be initially identified by searching the following databases:
MEDLINE(R)/ Embase, Ovid, and Cinahl, goggle scholar.
The following search terms are used as keyword or heading searches, using a two-component strategy:

For Q1
Component 1: {MEDICAL TOURISM/ HEALTH TOURISM/MEDICAL TOURIST/MEDICAL HOLIDAY/TRANSPLANT TOURISM/ SURGICAL TOURISM}.
AND
Component 2: {SPREADING OF ORGANISM}

For Q2
Component 1: {MEDICAL TOURISM/HEALTH TOURISM/MEDICAL TOURIST/MEDICAL HOLIDAY/TRANSPLANT TOURISM/SURGICAL TOURISM}
and
Component 2: {TREATMENT OUTCOMES/ COMPLICATIONS/ PATIENT OUTCOMES/ ADVERSE EVENTS/CURRENT CHALLENGES}

For Q3: {REASONS FOR SEEKING MEDICAL ATTENTION}

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Reference searches: Bibliographies and references list of papers that align with the eligibility criteria will be searched to identify any further relevant references, subject to the same screening and selection process.

Types of studies: Various kinds of evaluative study designs are eligible for inclusion. Reviews will not be selected on methodological quality. Articles that study patients after they have returned home.

Exclusion criteria: Sources like editorials, newspaper articles, and other forms of popular media will be excluded. Failure to fulfill any one of the above eligibility criteria will result in exclusion from the review, and the reviewer will resolve any apparent discrepancies during the selection process.

Data extraction: Following the initial selection, Data will be extracted from relevant papers using predefined evidence summary templates. Data will be collected based on the characteristics of the included studies, participants, and outcomes. The final decision will be made by a team consisting of the supervisor, committee members, and researcher for inclusion or exclusion. Any kind of disagreement will be recorded and resolved by further discussion.

Influencing factors for medical tourism:

Health journals and literature provide us some suggestions that entice people to travel overseas for receiving treatment. This emerging global phenomenon of medical tourism is directed to some demands and supply factors. Here we discuss some concerns of the patients that influence their decision-making process.

Searching information:

Before making decisions, most patients search for information in various sources. They seek out desired information regarding the treatment cost, quality of the hospital, super-specialty of the hospital, surgeons' credentials, available services, country status, and feedback reviews (Healy, 2009; Lunt and Carrera, 2011; Lunt et al., 2010; Medhekar and Newby, 2012). Those influence significantly for making a decision.

Cost comparison:

The first and foremost concerning thing is cost. Most patients often consider how much they can save after spending on treatment and travel with positive health outcomes. Besides, they compare with the expenditure of their existing health services. If they find it satisfactory, they proceed to their plan forward.

Waiting period:

Another significant reason is the long waiting time. Many patients decide to travel overseas to curtail their long unavoidable waiting period. Because of the long waiting list in their home country, they seek alternative options with reasonable cost and early recovery (Medhekar, A., Wong, H. Y., & Hall, J. E et, al., 2019).

The Risk for travel:

Traveling itself is one of the risk factors for a seriously ill patient. Moreover, intervention and/or surgery success rate, the chance of getting hospital-acquired or community-acquired infection, injury during movement of the patient, political status, and terrorist attacks' vulnerability all bring an impression to assign the destination (Parida et al.) 2017.

Safety measures from hospital:

Hospital safety and security is another area of concern for a medical tourist. Safety and security precautions consists of appropriate medical technology, minimum error on a medical and clinical decision, avoidance of negligence, continuous monitoring facilities for the patient, control infections, provide healthy food and safe drinking water, ensure privacy and maintain confidentiality (Medhekar, A., Wong, H. Y., & Hall, J. E et, al., 2019). All those give a sense of safety for medical tourists.

Holiday making opportunity:

It is not a significant concern for patients who travel. However, they utilize these opportunities to enjoy an exotic vacation and get another country's new flavor and vibe. It is often considered as an adjunct benefit of medical tourism.

Quality and compatibility of medical services:

A Medical tourist wants to be assured about the quality of service and its precision. They expect satisfactory and positive output about their diagnostic capability, surgical success rate, and adequate pre- and post-surgical care facilities (Burns, 2015; Ormond and Sulianti, 2017; Turner, 2011).

Hospital staffs:

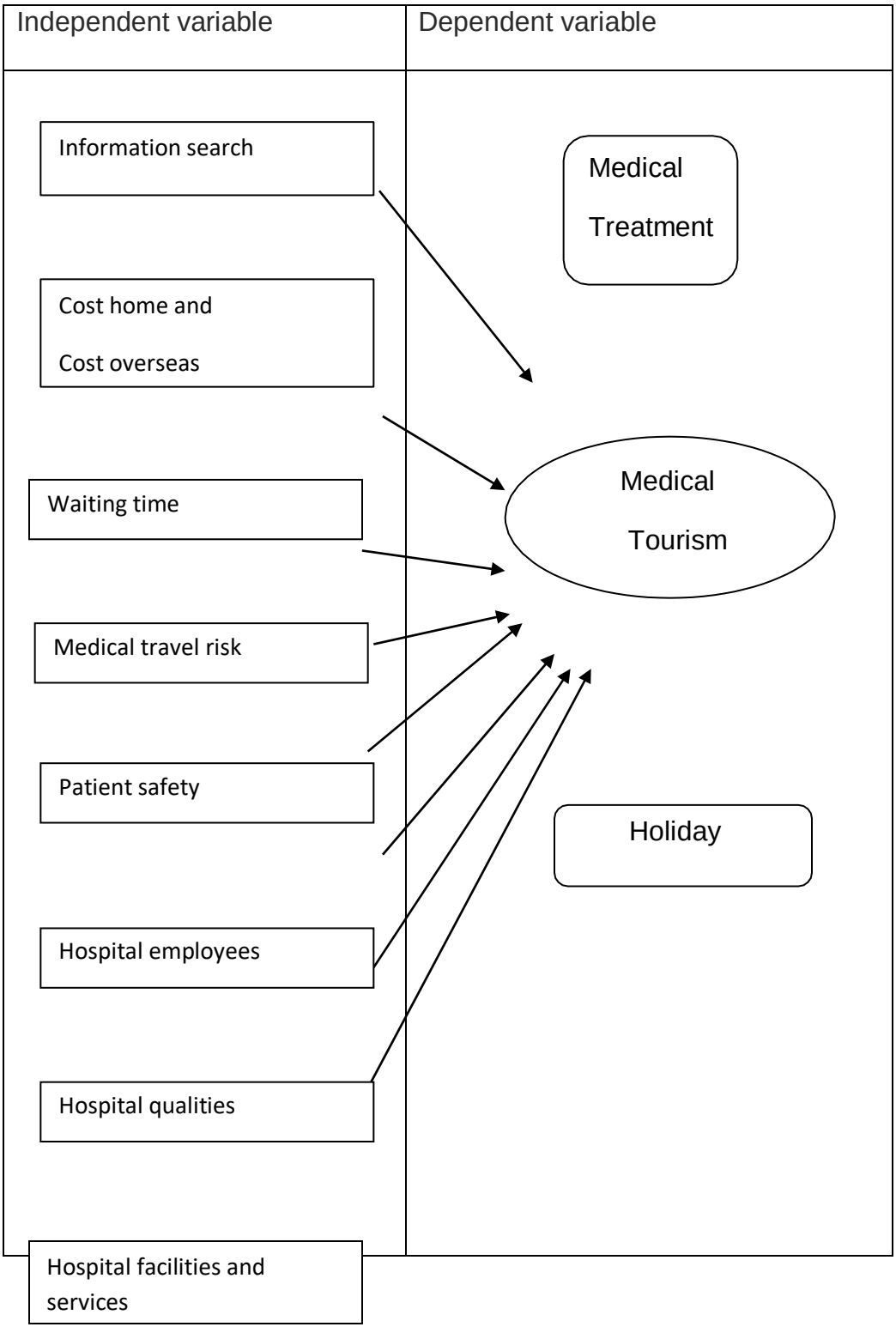
Employees mainly represent the hospital. They are driving force to run the hospital. The patient visits the hospital website to get an impression of medical and non-medical employees with their qualifications. Besides, they check the interpreter skill, which is essential for foreign patients.

Hospital facilities:

Besides diagnostic and treatment facilities, some other facilities are expected to have this hospital, such as good infrastructure, parking facilities, prayer room, waiting room for patient attendances, 24 hours pharmacy care, ambulatory service, banking, and foreign exchange facilities (Medhekar, A., Wong, H. Y., & Hall, J. E et, al.,) 2019.

Figure 1

Factors influencing on decision making for overseas travel:



Adapted from "Factors influencing inbound medical travel to India" by Anita Medhekar, Ho Yin Wong, John Edward Hall et. al., 2019, Vol.33.

Reasons for seeking overseas medical attention and problems associated with it:

Many important factors play a crucial role in convincing the patients and motivate them to seek medical care abroad. Some of the triggering factors such as service with reasonable cost, avoidance of unusual delay for getting treatment, overcoming legal restriction and cultural barrier, secure privacy, various alluring offers and incentives by insurers, and utilizing this opportunity both for vacation as treatment. Their visit aims primarily to undergo some surgery and/or interventions like bariatric surgery, cardiac surgery, arthroplasty, reproductive care, cataract, cosmetic surgery, and organ transplantation. The cost difference for those services is well detached from country to country. For instance, India takes $7000-12000 for hip replacement, whereas the United States charges $43000-100000. It significantly propels the patient to go to developing countries. However, because of this inconsistency Centers for Disease Control and Prevention and professional societies have published a guideline for patient safety {Table2}.

Summary of Reasons for Seeking Overseas Medical Treatment and Current Challenges and Concerns Associated with Medical Tourism

- Treatments not covered by health insurance
- Lack of health insurance

- Lack of technology or medical expertise
- Legal or cultural constraints
- Medical insurance plans
- Low cost
- Treatment availability
- Modern facilities
- Expanding capacity
- Remain anonymous
- Well-organized promoters
- Sightseeing and touring

Current Challenges and Concerns Regarding Medical Tourism

- Lack of regulation
- Lax accreditation of care providers
- Ethical concerns
- Fragmented or inadequate follow-up care
- Late complications
- High nosocomial infection rates
- Lack of oversight
- Increased risk for perioperative DVT
- Lack of liability
- Lack of standards

- Rise in cost
- Focus on wealthier foreign
- Exploitation of local donors or surrogates
- Imbalance of specialties

Adapted from "The Globalization of Healthcare: Implications of Medical Tourism for the Infectious Disease Clinician" by Lin H. Chen, Mary E. Wilson Clinical Infectious Diseases, Volume 57, Issue 12, 15 December 2013, Pages 1752–1759.

Table 1

Internet Resources from Professional Societies and International Organizations Focusing on Quality and Safety and Accreditation of Healthcare Abroad

Organization	Resource	Website
Organizations that provide guidance and information about quality and safety		
Prevention (CDC) Centers for Disease Control and	A chapter in Health Information for International Travel *2014* is devoted to medical tourism with advice and guidance for medical tourists	**wwwnc.cdc.gov/travel/yellowbook/2014/chapter-2-the-pre-travel-consultation/medical-tourism.htm**
American Medical Association	Guidelines for employers, insurance companies, and entities that "facilitate/offer incentives" for care	**http://www.ama-assn.org/ama1/pub/upload/mm/31/medicalt**

Organization	Resource	Website
	abroad	**ourism.pdf**
American College of Surgeons	Summary of information and internet resources on Nora Institute for Surgical Patient Safety website, including websites and companies that specialize in medical tourism	**www.surgicalpatientsafety.facs.org**
American Society for Plastic Surgery	Information on medical tourism with emphasis on issues at home and abroad	**www.plasticsurgery.org/articles-and-galleries/patient-and-consumer-information/patient-safety/medical-tourism.html**
International Society of Aesthetic Plastic Surgery	Certifies 1500 surgeons in 73 countries who meet US standards	**www.isaps.org**
American Dental Association	Information regarding travel, dental care, dental tourism, via Global Dental Safety Organization for Safety and Asepsis Procedures	**www.osap.org**

Organization	Resource	Website
and Transplantation Global Observatory on Donation	World Health Organization-Organization National de Transplants (WHO-ONT), a collaboration that provides worldwide transplant data, and information on organizational and legal aspects	**www.transplant-observatory.org/pages/home.aspx**
World Health Organization (WHO)	Guiding principles on human cell, tissue, and organ transplant	**www.who.int/transplantation/Guiding_PrinciplesTransplantation_WHA63.22en.pdf**
World Health Organization	World Alliance for Patient Safety	**www.who.int/patientsafety/en**
Organizations that provide healthcare standards and accreditation internationally		
Standardization (ISO)Internationa Organization for	A nonprofit organization that has developed standards that certify hospital quality-management programs internationally	**www.iso.org**
[JCAHO]) Healthcare Organizations Commission on Accreditation of	Provides accreditation of healthcare facilities internationally	**www.jointcommissioninternational.org**

Organization	Resource	Website
(JCI) (affiliate of the Joint Joint Commission International		
HealthCare (ISQua) International Society for Quality in	Umbrella organization that accredits JCI and other accrediting agencies	**www.isqua.org**
Advice) QHA Tren(Quality Healthcare	A private British company that provides accreditation to hospitals, clinics, primary care providers, residential care homes, and home care	**www.qha-international.co.uk**
Standards International (ACHS)Australian Council for Healthcare	An independent not-for-profit organization that is the leading healthcare assessment and accreditation provider	**www.achs.org.au**
Canadian Council on Health Services Accreditation	Accreditation Canada International promotes health accreditation and quality improvement worldwide	**www.accreditation.ca/ accreditation-programs**

Adapted from "The Globalization of Healthcare: Implications of Medical Tourism for the Infectious Disease Clinician" by Lin H. Chen, Mary E. Wilson *Clinical Infectious Diseases*, Volume 57, Issue 12, 15 December 2013, Pages 1752–1759.

Highlighted travel-associated bacteria from recent literature:

Travel-associated bacteria	**Highlights from the summary of recent literature**
Extended-spectrum β-lactamase (ESBL) producing Enterobacteriaceae	There is a global trend of rising ESBL Enterobacteriaceae. Over 60% of travelers to the Indian subcontinent return colonized with an ESBL organism.
Carbapenem-resistant Enterobacteriaceae (CRE)	The importance of travel to CRE varies by resistance mechanism. Approximately 0.4% of travelers to the Indian subcontinent return colonized with a CRE
Methicillin-resistant Staphylococcus aureus (MRSA)	MRSA acquisition is relatively less common; detected in 0.006% of travelers to Africa and the Middle East

Enterobacteriaceae :

Enterobacteriaceae family consists of many bacteria like Escherichia coli, Serratia, Klebsiella spp, Enterobacter spp., Proteus spp., marcescens Citrobacter spp which are normal gut flora and play a crucial role as a pathogen both in hospital and community settings (Azap OK, Arslan H, Serefhanoglu K, et al., 2010). It transmits in humans through various ways and acquires antibiotic resistance through some means like plasmids, transposons, or other resistance elements. The dissemination of novel extended-spectrum b-lactamases (ESBLs) and carbapenemases (CPEs) over the last two decades are the consequences of a dramatic escalation of antibiotic resistance property of the organisms.

In Enterobacteriaceae, the factor that plays a vital role in β-lactam resistance is β-lactamase (Livermore DM, Woodford N. 2006). This enzyme β-lactamase incapacitates the β-lactam ring and inactivates the compounds by hydrolysis. The most important thing is recognition of 'newer' β-lactamases that consist of plasmid-mediated AmpC β-lactamases (e.g., CMY types), extended-spectrum β-lactamases [ESBLs (e.g., CTX-M types)], carbapenem-hydrolyzing enzymes or carbapenemases {e.g. class A (KPC types) and class B [e.g., the Metallo-β-lactamases (MBLs), such as VIM, IPM, and NDM types]} and class D oxacillinases (e.g., OXA-48-like enzymes) (JacobyGA, Munoz-PriceLS,2005 , Nordmann P, NaasT, PoirelL,2011).

Infection caused by ESBL:

CTX-M

During the 1980s and 1990s the majority of ESBL had been identified, which belonged to SHV or TEM types evolved from parent enzymes such as TEM-1, TEM-2, and SHV-1(Paterson DL, Bonomo RA. 2005). CTX-M-b-lactamase, a kind of ESBL, originated

from Kluyvera spp. and became prominent during the 2000s, which was isolated from e. coli. Currently, it is widely disseminated and the most common type of ESBL globally (Pitout JD, Laupland KB et,al.,2008)

Medical tourism is considered a substantial factor in spreading infection due to ESBL producing bacteria in various countries. Specific types of SHV-12 producing salmonella type was detected in a Dutch patient who was a returning traveler from the Philippines. Likewise, CTX-M-15 producing shigella sonnei was discovered in Czech returning from Asia (HrabakJ, EmpelJ, GniadkowskiM, et al. 2008).

The first evidence came to spotlight during the mid-2000s when studies conducted in Auckland, New Zealand and Calgary, Canada revealed that travelers engaged in spreading the CTX-M producing E. coli among different countries. The survey from New Zealand demonstrated that patients visited with community-associated genitourinary tract infection in Auckland hospital due to E. coli with CTX-M-15 types had the previous history of travel in the Indian continent. All the patients did not have traditional risk factors for developing urinary tract infections. The study in Calgary illustrated a similar picture. It pointed out that the travel to the Indian subcontinent, Africa, and the Middle East was somehow connected to spread the community-onset infection with ESBL among returning travelers (Laupland, K. B et. al.,2008). A follow-up study provided a clearer picture which showed CTX-M-15 producing ST131 was responsible for most diseases. A study in a Switzerland tertiary hospital showed that people consuming antibiotics while traveling high-risk countries also played a role in spreading infections due to ESBL producing e. coli and K.pneumoniae (Kuster, S. P et. al., 2010).

Table 2

The role of travel in the worldwide spread of multiresistant Enterobacteriaceae

Country (year of study)	Type of study	Infections	Travelers / patients	Country visited	Organisms	β-Lactames
New Zealand (2004–06)	retrospective case study	community-onset UTIs	13	India (10/13 patients), China, USA	E. coli	CTX-M-15
Canada (2004–06)	prospective population-based surveillance	several, including community-onset UTIs	247	India, Middle East, Africa	E.Coli	CTX-M-14, -15 and others
Switzerland (2005–07)	case–control	various	58	NS	K.pneumonie, E. coli	ESBLs
Sweden (2007–08)	Colonization of travellers	travellers' diarrhoea	242	various	E.Coli	CTX-M-1 and -9 groups
UK (2006–08)	colonization of travellers	travellers' diarrhoea	182	various, including India	E.Coli	CTX-M-15
Canada (2009)	colonization of travellers	travellers' diarrhoea	113	various, including India	E.Coli	CTX-M-14 and -15

Sweden (2007–09)	prospective colonization of travellers	asymptomatic	100	various, including India(7/8 patients)	E.Coli	CTX-M-14, -15 and others
Australia (2008–09)	prospective colonization of travellers	asymptomatic	102	various, including India(11/14 patients)	E.Coli, Others	CTX-M-1 and -9 groups
France (2005)	case report	Upper UTI	1	USA	K.pneumonie	KPC-2
France (2005)	case report	IAI	1	USA	E. cloacae	KPC-3
Israel (2006)	characterization of resistance	Various	100	USA	K.pneumonie	KPC-3
Greece (2007)	case report	rectal colonization	1	USA	K.pneumonie	KPC-2
Colombia (2008)	case reports	Various	84 (32 infected)	Isreal	K.pneumonie	KPC-3

Norway and Sweden (2007–08)	case reports	Various	7	Greece, Israel	K.pneumonie	KPC-2 and-3
The Netherlands (2009)	case reports	pneumonia	1	Greece	K.pneumonie	KPC-2
Switzerland (2009–10)	case reports	NS	4	Greece, Italy	K.pneumonie	KPC_2 and -3
Canada (2008)	case reports	UTI, IAI	3	USA	K.pneumonie	KPC
UK (2009)	case reports	UTI	2	Curacao	K.pneumonie	KPC-2
Scandinavia (2005-08)	characterization of resistance	Various	8	Greece, Turkey	K.pneumonie	VIM-1
USA (2010)	case reports	sepsis	1	Greece	K.pneumonie	VIM-1
Ireland (2010)	case reports	wound infection	1	Greece	K.pneumonie	VIM-1
Luxembourg (2010)	case reports	wound infection	1	Greece	K.pneumonie	VIM-27

Sweden (2008)	case reports	UTI	1	India	K.pneumonie, E. coli	NDM-1
UK (2008-09)	characterization of resistance	Various including UTI	37	India	K.pneumonie, E. coli	NDM-1
The Netherlands (2009)	case reports	rectal colonization	2	India	K.pneumonie	NDM-1
USA (2010)	case reports	UTI	1	India	E. coli	NDM-1
Australia (2010)	case reports	pneumonia	1	Bangladesh	E. coli	NDM-1
France (2010)	case reports	UTI	1	India	Citrobacter freundii	NDM-1
Japan (2009)	case reports	bacteraemia	1	India	E. coli	NDM-1
Germany (2009)	case reports	colonization	1	India	E. coli	NDM-1

Austria (2009–10)	case reports	wound infection, IAI	2	Pakistan, Kosovo	K.pneumonie,	NDM-1
France (2010)	case reports	wound infection	1	Iraq	K.pneumonie,	NDM-1
Canada (2010)	case reports	Upper UTI	1	India	E.Coli	NDM-1
Belgium (2010)	case reports	Various	3	Pakistan, Kosovo, Montenego	E. coli, K. pneumoniae, E.cloacae, Morganella morganii	NDM-1
Singapore (2010)	case reports	Bacteraemia	1	Bangladesh	E.Coli	NDM-1
France (2010)	case reports	rectal colonization	2	Morocco	K.pneumonie	OXA-48
France (2010)	case reports	endometritis	1	Turkey	K.pneumonie	OXA-48
Slovenia (2011)	case reports	rectal colonization	1	Libya	K.pneumonie	OXA-48
Israel (2007–11)	case reports	Various	4	Jordan ,Georgia	E. coli, K. pneumonia, Klebsiella	OXA-48

	oxytoca

IAI, intra-abdominal infection; NS, not stated.

Adopted from "The role of international travel in the worldwide spread of multiresistant Enterobacteriaceae" by Akke K. van der Bij, Johann D. D. Pitout *Journal of Antimicrobial Chemotherapy*, Volume 67, Issue 9, September 2012, Pages 2090–2100.

Studies from Sweden, the UK, and Canada demonstrated that ESBL-producing Enterobacteriaceae were present among patients with traveler's diarrhea. The Swedish research described that 36% (50/138) of Swedish people presented with diarrhea on return had ESBL-producing E. coli in their stools had traveled outside Europe. The UK study showed the difference in the genetic environment of the *bla*CTX-M-15 gene of ESBL-producing *E. coli* between travelers and non-travelers isolated from their stool. A Canadian study revealed that CTX-M-producing *E. coli* was positive in 26/107 (24%) of returning travelers' stool, whereas only 5% was present in non-travelers.

Swedish and Australian studies have described the colonization of bacteria through medical tourism and/or traveling (Kennedy, K., & Collignon, P.2010). One hundred volunteers traveled outside Europe were enrolled in Swedish research and concluded with 24 of them were positive for CTX-M-producing *E. coli.* Interestingly India is a top vulnerable spot for acquiring CTX-M producing bacteria where every seven was positive out of eight.

KPC

KPC types (where KPC stands for K. pneumoniae carbapenemase) is the most clinically significant class A carbapenemase, first reported in late 1990 in North Carolina. As of now, more than ten different types have been identified (Walther-Rasmussen, J., & Høiby, N. 2007). These enzymes are responsible for providing resistance to several antibiotics groups, including carbapenems, cephalosporins, cephamycins, and monobactams, and are weakly inhibited by clavulanic acid and tazobactam (Table 1). Among enetrobactracea, especially e.coli and k. pneumonia has shown properties of KPC type 2 and 3. In particular, parts of the world, such as the North-East USA, Puerto Rico, Colombia, Greece, Israel, and China, are considered endemic and important for resulting nosocomial infections (Nordmann, P., Cuzon, G., & Naas,et.al., 2009).
Certain international types, namely ST258 is responsible for the dissemination of KPC-producing k. pneumonia worldwide similar to that of CTX-M producing e.coli. (Nordmann, P., Cuzon, G., & Naas,et.al., 2009).

The role of travel in spreading KPC-producing b- lactamase is limited to the case report (Table-2). The first case was an 80-year-old, admitted in New York was hospitalized previously in Paris during 2005 (Naas, T, et. al., 2005). KPC-2 producing K.pneumonea was isolated from his blood and urine, which was resistant to all antibiotics except colistin and fosfomycin. Likewise, KPC-3 producing Enterobacter cloacae was detected in abdominal pus in a 30 years old patient hospitalized in New York previously. During 2006, in Isreal KPC-3 epidemic clone emerged and caused high mortality and nosocomial outbreaks. Later it was identified that the clone St258 caused infection in Isreal via US travelers in early to mid-2000s (Naas, T, et. al., 2005). The next case occurred in Greece in 2007, creating a similar outbreak. Later in genetic analysis suggested that this gene blaKPC-2 is originated from New York (Cuzon, G, et. al., 2008). In 2008 in a Colombian hospital, 32 patients presented identical types of infection. Among them, most were medical tourists who came from Isreal for liver transplantation. The blaKPC clone was identified as KPC-2 and showed fingerprints similar to that of ST258 in PCR (Lopez, J. A, et. al.,2011).

This case reports indicate the role of medical tourism for spreading KPC-producing enterobacterocea. Almost all of the cases patients first visited the endemic area due to seek medical attention and then hospitalized to their own country with this infection.

VIP and IMP

The mettalo-b-lactamase of IMP and VIM was detected in Pseudomonas aeruginosa. A study from Greece suggested that P. aeruginosa is the reservoir for VIM. IMP and VIM type MBL are class1 integron, which comprises various genes, responsible for antimicrobial resistance (Poirel, L., Pitout, J. D., & Nordmann, P,et al.,2007).

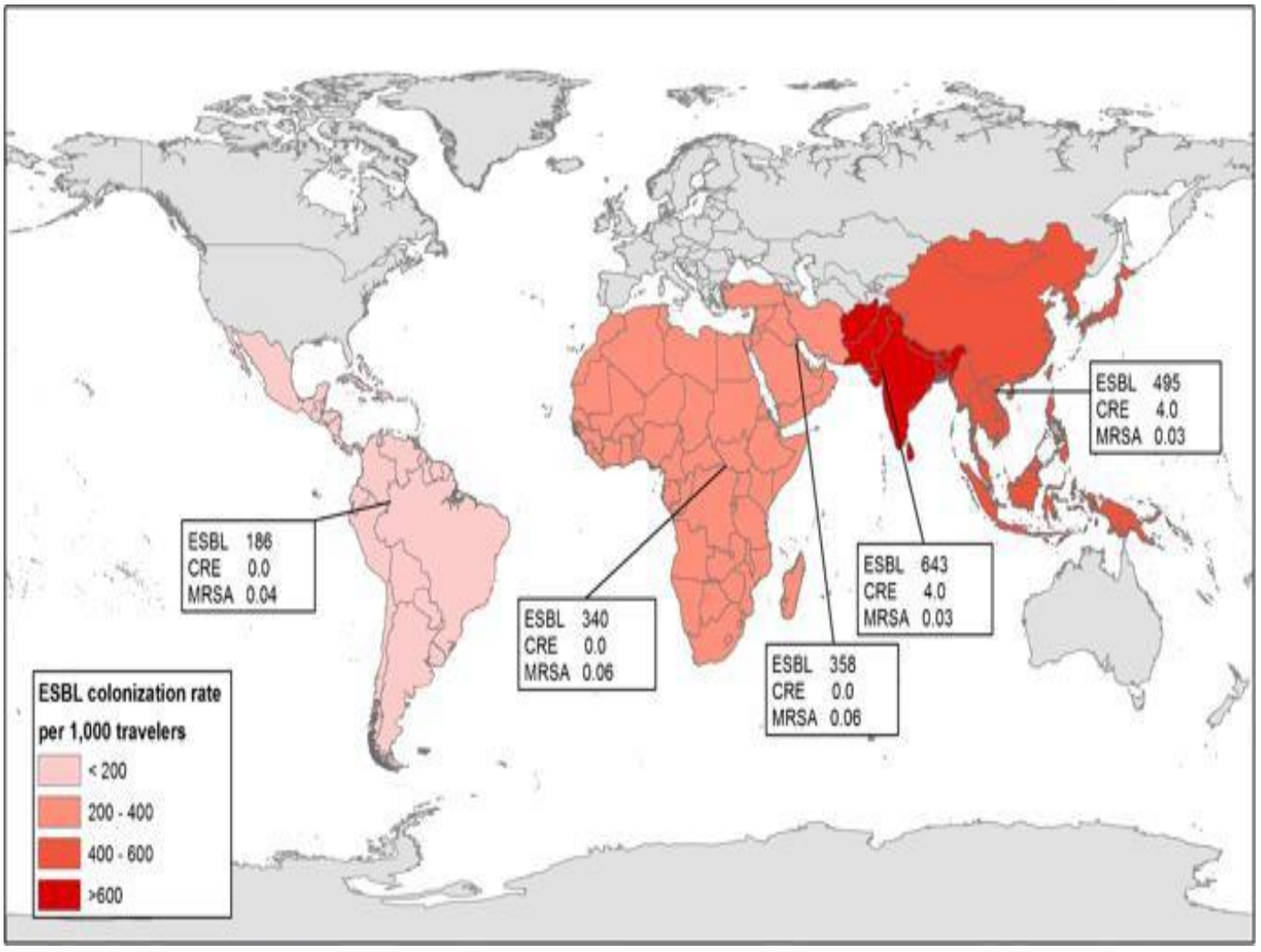
The first case was reported in Athens, Greece, when K. pneumonea producing VIM was detected in a patient admitted to ICU (Giakkoupi, P et. al., 2003). VIM producing enterobactrecea (K.pneumonea VIM-1) are endemic in Greece, causing nosocomial outbreaks and significant public health concern for Mediterranean country. A recent study from three hospitals in Athens for investigating the bloodstream infection revealed that 37.6% of K.pneumonea was blaVIM-1 producer, whereas 77.8% of them are from ICU. VIM type B-lactamases are also responsible for the outbreak in Italy and Spain. (Psichogiou, M et. al., 2008).

The molecular study revealed that outbreaks in Athens and Italy are caused for VIM-1 of K. pneumonea while Serres (Greece), Spain, and France hold the dominant clone. BlaVIM-1 shows different restriction patterns, variable in size, and belonged to board host range replicon group (Vatopoulos A ,2008).

The leading causes of spreading VIM and IMP type MBL are not clear. Sporadic cases are found in several European countries (including Portugal, France, Germany, Belgium, Poland, Hungary, Norway, Sweden, Denmark, the UK, and Ireland), Turkey,

Lebanon, South America (including Brazil, Argentina, and Colombia), the USA, Africa (including Tunisia, Algeria, and South Africa), Asia (including Japan, China, South Korea, and India) and Australia (Nordmann, P., Naas, T., & Poirel, L et. al., 2011). However, most cases in Europe and Ireland patients were previously admitted to the hospital in Greece and later diagnosed infections associated with VIM-producing K.pneumonea strain.

Figure 2



The number of drug-resistant organisms detected per 1000 healthy travelers. The risk of travelers returning with a drug-resistant bacterial organism varies by region visited any

type of organism. The highest risk has been observed in travelers from the Indian subcontinent. ESBL = extended-spectrum beta-lactamase; CRE = carbapenem-resistant Enterobacteriaceae; MRSA = methicillin-resistant *Staphylococcus aureus*. Data for figure based on weighted average of published studies

Adopted from "Bringing home unwelcome souvenirs: Travel and drug-resistant bacteria" by Langford BJ, Schwartz KL. Can Commun Dis Rep 2018;44(11):277–82

NDM

NDM producing e.coli and K.pneumonea was recovered from a Swedish patient admitted to New Delhi hospital in India. According to Kumarasamy et al., India and Palestine are the most prevalent zones for NDM producing bacteria. They also recovered patients in the UK suffering from an infection due to NDM producing bacteria traveled India for medical tourism. These patients showed varieties of diseases, mainly hospital and community-acquired, and UTI is the most common among all infections. NDm-b-lactamases are widespread among environmental bacteria and also in subcontinent countries like India, Pakistan, and Bangladesh (Castanheira, M et. al., 2007, Lascols, C et. al.,2011). During Feb 2010 and July 2010, among 780 isolated enterobactracea, 6.9% are \ndm producers reported in various Northern India hospitals. The prevalence of NDM -1 producing bacteria was 8% in Varanasi hospital, while in Rawalpindi, Pakistan, it was 18.5% (Perry, J. D et. al., 2011). Sporadic cases of NDM infections were reported in several countries, including Europe, North America, the Middle East, Asia, Africa, and Australia (Nordmann, P et. al.,2011).

The majority of NDM-1 producers have various resistant mechanisms and show resistant to several drug resulting in limited options for treating this sort of infections.

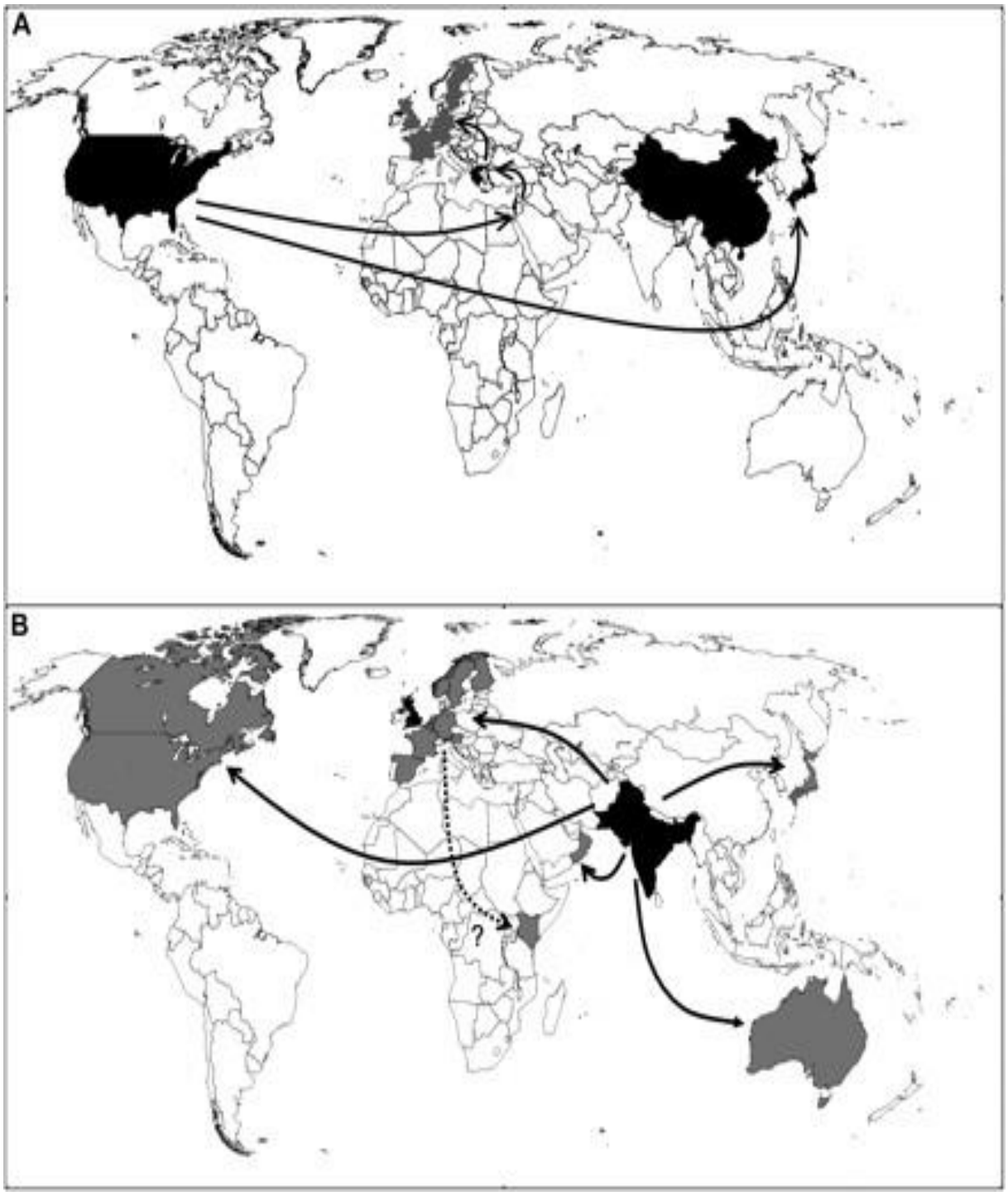
NDM b-lactamases are present in members of enterobactrecea but remarkably present in e.coli and K.pneumonea. However, internationally sequence types such as e.coli ST131 and ST101 have carried blaNDM gene (Nordmann, P et. al.,2011).

The case reports for NDM producing infections are limited. The study shows that patients with NDM infection found in different parts of the world like North America, Europe, and Australia were admitted to an Indian subcontinent hospital previously. Most of them are tourists who visited there to undergo medical procedures such as cosmetic surgery and renal dialysis. Bacteria were identified from their stool through microbiological investigations, while patients presented diarrhoeal symptoms after returning from the Indian subcontinent (Leverstein-Van Hall,et. al., 2010). Other sporadic cases were notified in different parts, such as the Balkan states and the Middle East (Nordmann, P et. al.,2011).

OXA-48

In 2001, OXA-48 was identified in Turkey, and it has been detected from K.pneumonea; since then, OXA-48 producing bacteria plays a vital role in major nosocomial outbreaks in Turkey (Poirel, L et. al., 2004). Although outside Turkey, the first reported case was in 2007 in a Belgium hospital. Since then, OXA-48 producing sporadic cases have been identified in several countries, including France, Germany, Spain, The Netherlands, and the UK and North Africa (Nordmann, P et. al.,2011). It is considered that OXA-48 producers are endemic to Morocco, Tunisia, and Turkey from several reports. Mobile plasmid named 62.5KB, also responsible for the spreading of carbapenamase. It belongs to Incl/M group, and additional resistance genes are not carried by this plasmid (Poirel, L., Bonnin, R. A., & Nordmann, P.et. al., 2012). Recently in India, another type, OXA-181 from K. pneumonea has been identified which is a point mutation of an OXA-48 variant (Nordmann, P et. al.,2011)

Fig 3



Schematic representation of epicenters (black) and reported/potential importations (gray) of Klebsiella pneumoniae carbapenemase (A) and New Delhi metallo-β-lactamase-1 (B) ß-lactamase-producing organisms

Adopted from "**Country-to-Country Transfer of Patients and the Risk of Multi-Resistant Bacterial Infection by** Benjamin A. Rogers, Zohreh Aminzadeh, Yoshiro Hayashi, et. al., Clinical Infectious Diseases, Volume 53, Issue 1, 1 July 2011, Pages 49–56,

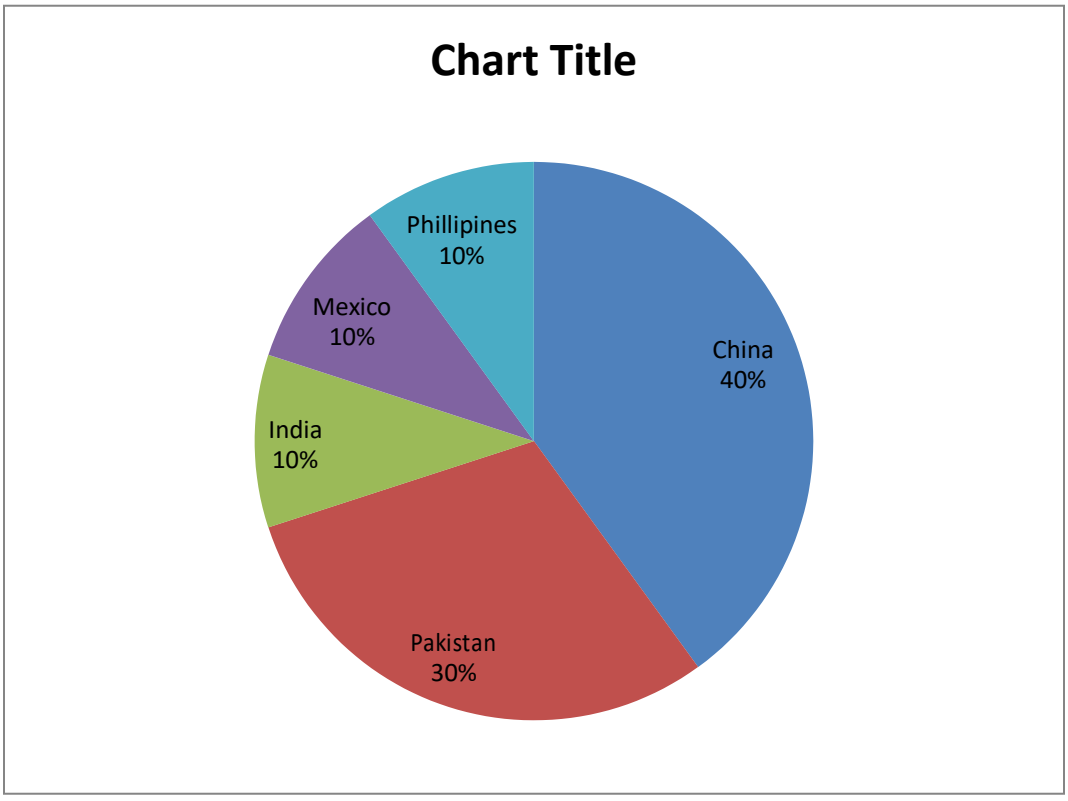
OXA-48 and OXA-181 show vigorous activity against penicillin whereas against oxyimino-cephalosporins (e.g., cefotaxime, ceftriaxone, and ceftazidime) and aztreonam its activity is remarkably weak (Nordmann, P et. al.,2011). These enzymes are not inhibited by chelators such as EDTA, or 'classical' β-lactamases inhibitors, such as clavulanic acid or tazobactam (Table 1) and were found in e.coli and K.pneumonea. OXA-48 increases the resistance to cephalosporin and carbapenem, which is co-produced by the permeability barrier in bacteria. (Nordmann, P et. al.,2011).

Likewise, KPC, VIM, and NDM-producing bacteria, OXA-48 type b-lactamases, are limited to the case report. Patients found in France had been hospitalized in Morocco and Turkey while in Slovenia a case-patient had been previously admitted in Libya hospital (Poirel, L., Bonnin, R. A., & Nordmann, P.et. al., 2012). A study from Isreal revealed that OXA-48 producing bacteria was introduced in Isreal from the admitted in Georgia and Jordan already, and all of them were medical tourists (Adler, A et. al., 2011). Recently OXA-48 producing K.pneumonea ST395 has been detected in the Netherlands was present in France and Morocco, suggesting that this type was imported from either of these countries to the Netherlands. (Potron, A et. al.,2011)

Kidney Transplant:

According to the report, around 100000 organ transplants have been performed annually in 98 countries until 2010 (Delmonico, F. L et. al., 2011). By 2007, a globally estimated 10% transplant is due to transplant tourism. The data revealed by the US for 1987 to 2006 about transplant tourism indicated approximately 373 cases, which were mostly Asian origin, male and lower education status, traveled to India, China, and the Philippines (Merion, R. M et. al.,2008). China sold organs routinely until it was banned by 2007. In 1994, India abolished this practice of vending organ.

Fig 4: Destinations for kidney transplantation



Organ trading is forbidden all over the world except Iran. Buying and selling organs persist there. WHO formulated a new guideline at 63rd World Health Assembly stated that "organs should be donated freely without any monetary payment or reward of

monetary value." (WHO, 2013). In some countries, the black market continues its illegal organ business despite strict promulgations from a respected authority. Already many concerns have been raised due to kidney transplants. For instance, if the organ is collected from an executed prisoner, it could be a potential infection source for the recipients and causes complications because of immune suppression.

Some infections such as human T-lymphotropic virus types 1 and 2, malaria, Trypanosoma cruzi, rabies, West Nile virus, Leishmania, and several fungi are geographically restricted and resulted from transplantation (Martin-Davila, P et. al.,2008). Infection source is thought to be either a blood transfusion or from organ transplantation. Based on the report, 45 cases have been marked suffering from malaria who underwent transplantation; 36 for renal and 14 for others, including three heart, five liver, six renal transplants (Martin-Davila, P et. al., 2008).

A systemic review showed the outcome differences in graft survival regarding patients undergoing commercial transplants and organ sharing. Patients receiving commercial transplantations tend to have more chances of developing infections, including hepatitis B, hepatitis C, malaria, HIV, and tuberculosis, and have experienced a high index of postoperative surgical interventions (Sajjad, I et. al., 2008). Likewise, a higher incidence of infections, acute rejection, and hospitalization was observed who received transplants abroad (n= 87 China) and followed at South Korea. A meta-analysis (39 centers globally) ended with the statement that graft sustainability and patient survival for transplant tourists are one year lower than that of domestic recipients (Anker, A. E., & Feeley, T. H. 2012).

Patient Postoperative course

1 ESBL urinary tract infection

2 DGF; urinoma with Candidal urinary tract infection; transplant nephrectomy, died of candidal septicemia

3 DGF; CMV colitis; ESBL Klebsiella septicemia

4 DGF; recurrence of IgA nephropathy; perinephric hematoma; Klebsiella peritonitis; transplant failed within 1 year

5 Hydronephrosis from the retained ureteral stent, acute rejection

6 Acute rejection

7 Recurrent ESBL urinary tract infection

8 Hepatitis C infection

9 No significant complications

10 Klebsiella UTI and pneumonia

ESBL: extended spectrum beta-lactamase DGF: delayed graft function; UTI: urinary tract infection.
(Commercial renal transplantation: A risky venture? A single Canadian centre experience

Anil Kapoor, MD, FRCSC, Kevin G. Kwan, MD, FRCSC, and J. Paul Whelan, MD, FRCSC)

Cosmetic surgery:

Medical tourism is becoming more and more enthralling to many people, particularly for cosmetic procedures. Every year around 4M Americans head to various destinations to get their desired medical or surgical care **(**Singh, 2016). Some factors trigger their decision to make travel, especially treatment availability, affordability, and treatment quality. However, post-surgical infections are increasing at an alarming rate, most commonly with RGM. It is evidenced by many reports and has already drawn attention and has become a severe health concern. The most common destinations for cosmetic surgery are the Dominican Republic, Mexico, Thailand, China, Vietnam, India, Turkey, and the Caribbean, etc.

Figure5

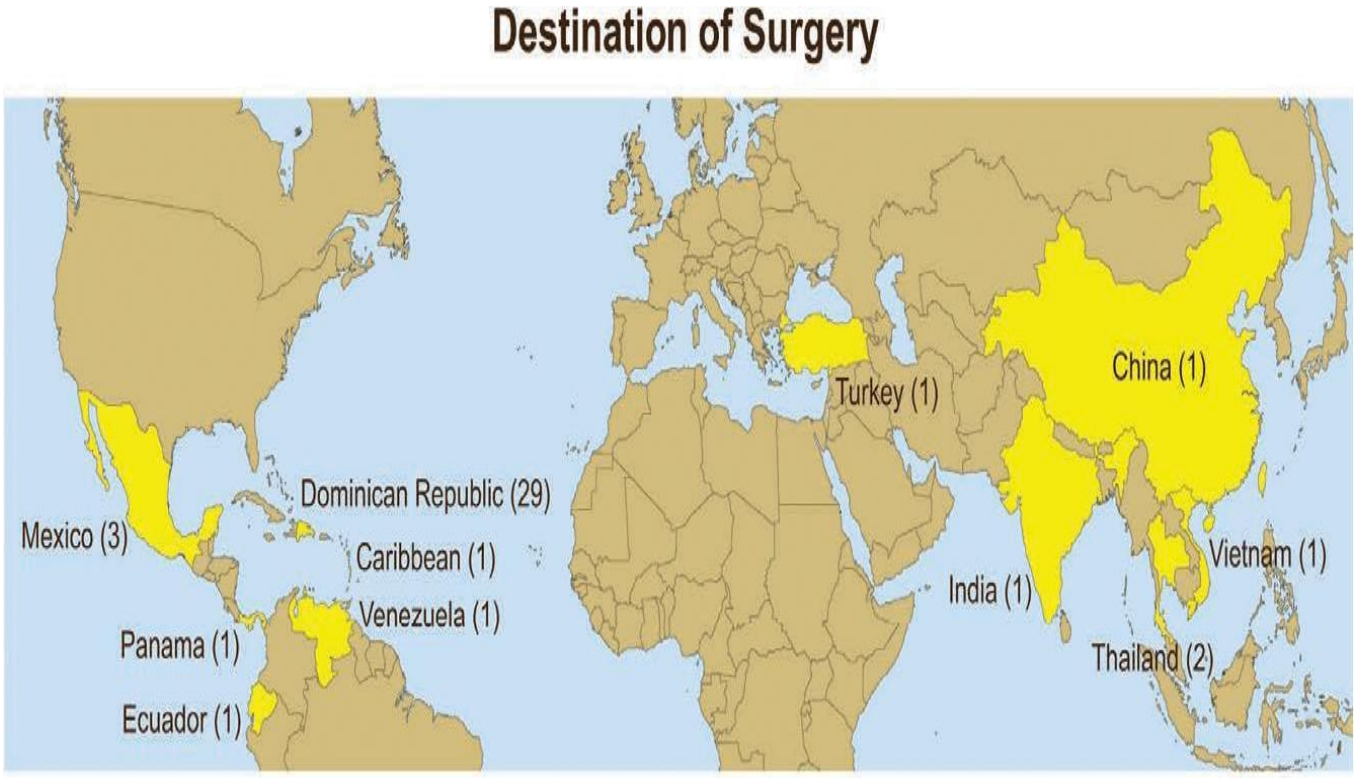


Fig. 1. Destination of surgery, showing the countries where patients underwent various medical procedures

Organisms responsible for underlying complications are non-tuberculous mycobecteria, staphylococcus, streptococcus and propinobacterium. Among them non-tuberculous mycobecteria (NTM) show more resistant to drug and cause of skin

and soft tissue infection especially on surgical site (Lucas R et . al., 2017)**.** Patients easily get infected with these organisms because of its ubiquity in environment.

Cosmetic procedures:

Mostly practiced surgical procedures for cosmetic purposes throughout the world are as follow:
Breast surgery (augmentation, reduction, mastopexy, change of implants), body contouring (abdominoplasty, liposuction, thigh lift, brachioplasty), facial surgery (facelift, otoplasty, blepharoplasty, rhinoplasty), injections (botulinum toxin, fillers), and others (eg, hair transplantation, genital rejuvenation surgery).

➢Procedure Breast surgery
➢ Body contouring
➢Injections
➢Facial surgery
➢Others

Complications:

➢Infection
➢Wound breakdown
➢Pain/discomfort
➢Implant rupture
➢Dissatisfaction
➢Capsular contracture
➢ Hematoma
➢ Others

Apart from the complications, it has huge impact on patients' lives. Patients often made visit in emergency department seeking attention for infections. On most occasions, they were discharged with empirical therapy and again came up with little or no improvement and sometimes even worse conditions. Some patients required surgical debridement. Several weeks are needed to care the wounds and all patients required long term antibiotic therapy with follow up. Moreover, sometimes complex antibiotic regimens are prescribed to cure infections because of antibiotic-resistant strains. Delayed return to work another big consequence of complications because of difficulties with wound management, pain control, and medication administration. In some instances, some patients presented recurrent symptoms and required repeat hospitalizations, operations, and courses of antibiotic therapy. The average time for returning at workplace was 6.7 months (ranging from 3 weeks to 16 months) (James C. Lee et, al.,2018). In the USA, estimated indirect cost of Mycobacterium infection was calculated to be $24,401 per person and increased to $123,236.47 when total hospital charges are taken into account (James C. Lee et, al., 2018). In many cases, treatment costs for complications may outweigh the savings of overseas treatment.

Impact of Medical Tourism:

The first and foremost consequence of medical tourism is the spreading and getting introduced to newer drug resistance organisms. Physicians often struggle to identify and treat infections. As a result, patients suffer badly for an extended period because of complications arising from the various surgical procedures. Apart from drug resistance, there are several impacts of medical tourism, which are discussed below.

Financial:

Medical tourism has a significant impact on the individual and their families. On some occasions, medical tourism for experimental procedures may cost considerable family resources (Song, 2010). As a result, the family struggles for bearing expenses and falls into debt.

The financial impact is enormous for source countries that may arise from the publicly funded health care system. Patients received overseas treatment sometimes requires emergency medical or surgical attention to their state (Cheung and Wilson, 2007; Jeevan and Armstrong, 2008; Healy, 2009). Cost may result from treatment receiving in a publicly funded hospital. Additionally, spreading infections from travel bring more cost to the home country (cf Newman et al., 2005). Similarly, health and social cost increases because of multiple births from overseas fertility treatment (cf Ledger et al., 2006).

Exacerbation of a two-tier system:

The number of medical tourists and the source country's health system growth is associated with a considerable extent. Outflows of more patients for receiving medical or surgical care overseas reduce revenue for the source country significantly. Besides, it also declines the flow of political support for developing local services. Such flow of the patients gradually dilutes the pressure regarding the fund for particular facilities and technology.

Competitive pressure on local providers:

Medical tourism's driving force is cost because sometimes, desired treatment may be available in the home country, especially in private settings that cost a lot. As a result, patients often visit for overseas treatment. Ultimately it exerts pressure on domestic health settings to import more advanced treatment facilities and reduce the cost they offer (Herrick, 2007).

Trickle-down of best practice/technological transfer:

In destination countries, sometimes resources are taken away from domestic people and invested heavily in the private sector because of the massive volume of medical tourists. Another noticeable incidence is that investment goes toward the urban care hospital rather than rural settings where mainly domestic people seek medical attention initially. Moreover, there is a significant imbalance in the distribution of resources toward the conditions associated with medical tourists rather than with primary health care of the local people. For example, in some countries, private sectors are hoarding more resources, and advanced medical facilities and personnel are being taken away from the local population (Sengupta, 2011). Another study (Pennings, 2007) claimed that in India, private hospitals are committed to serving free health care services to the extent of 20% of resources, but no follow-up has been carried out to ensure this.

Management approach:

Hospitals must have some preemptive strategies to manage patients who are being transferred from other countries carrying resistant strains. Isolation is prime priority for the countries that are not endemic for the strains but receiving patients from the endemic zone. Therefore, all the institutions for non-endemic or little endemic area should establish preemptive contact isolation to maintain and ensure the safety. In contrast, those institutions are already in endemic area and receiving patients from another endemic zone may show least willingness to preemptive approach. However, new drug resistant strains introduced by patients or hospital adapted strains could potentially not only pose a threat to life but also put a challenge to clinician by strengthening the resistance capacity.

Table 3

Recommendations for the Management of Patients Who Have Been Hospitalized Internationally

1. Maintain vigilance. Ask specifically about healthcare contact whenever a patient reports international travel within the previous 12 months.
2. Preemptive isolation and screening should be used in patients with a history of international hospitalization and who have a high risk of carriage of multiresistant organisms. Isolate patients who have had direct hospital-to-hospital transfer or recent international hospitalization involving prolonged hospital stay, intensive care or critical care admission, major trauma, burns, or receipt of chemotherapy or immunosuppression (eg, solid-organ or stem-cell transplant).
3. Screening needs to be customized to the receiving institution: Focus screening on organisms that are not already endemic at your site. Basic screening may include axillary, inguinal, and nose/throat swabs PLUS rectal swab or stool sample PLUS clinical specimens including catheter urine, surgical drain, or wound discharges—screen for MRSA-, VRE-, and ESBL-producing or carbapenem-resistant GNB.Only screen for *Clostridium difficile* if diarrhea is present.
4. Receive transferred patients in an area of the hospital equipped to manage isolation for multiresistant organisms. Patients may initially require management in an area of higher acuity than required for their medical care (eg, patients for rehabilitation may need to go to an acute ward until screened).

5. All receiving institutions should have a readily accessible infection prevention policy defining at-risk patients, screening procedures, and preemptive isolation criteria.

If an institution frequently receives patients from a particular location, a customized protocol should be developed and maintained for this location: Including an outline of the current pathogens of concern and empirical therapy is recommended in the case of infection.

NOTE.ESBL, extended-spectrum β-lactamase; GNB, Gram-negative bacilli; MRSA, methicillin-resistant Staphyloccus aureus; VRE, vancomycin-resistant enterococci.

Adopted from "**Country-to-Country Transfer of Patients and the Risk of Multi-Resistant Bacterial Infection by** Benjamin A. Rogers, Zohreh Aminzadeh, Yoshiro Hayashi, et. al., *Clinical Infectious Diseases*, Volume 53, Issue 1, 1 July 2011, Pages 49–56.

Table 4.

Approach to Suspected Bacterial Sepsis in Patients Previously Hospitalized in Another Country

1. Ensure appropriate microbiology samples for the clinical presentation (eg, blood cultures, urine culture, respiratory tract cultures) if required.

Notify the microbiology laboratory of the patients' origin. They may broaden their testing beyond their normal scope (eg, detection of NDM-1, Clostridium difficile ribotype).

2. If screening has identified MROs: These bacteria must be targeted in empirical

therapy.

If susceptibilities are available use these to guide antimicrobial selection. If susceptibilities are not available, empirical therapy may include agents such as linezolid or daptomycin (for VRE and MRSA) and polymyxin B, colistin, or amikacin for multidrug-resistant gram-negative bacilli. If available, consultation with an infectious disease physician or clinical microbiologist may be helpful in selecting the optimal agent for identified pathogens.

3. If no screening results are available: Therapy must target the prevalent pathogens at the transferring institution.

When possible, ascertain these by direct discussion with this institution as recent outbreaks may not be publicized. See suggestions above for empirical therapy.

4. If screening does not detect an MRO: Treat as per local guidelines. However, screening is not 100% sensitive.

If the patient fails to improve on empirical therapy then reassess for occult sites of infection and reculture as extensively as possible. Consider empirical therapy for organisms prevalent at the transferring institution as outlined above.

NOTE.MRO, multiresistant organism; MRSA, methicillin-resistant Staphyloccocus aureus; NDM-1, New Delhi metallo-β-lactamase; VRE, vancomycin-resistant enterococci.

Adopted from "**Country-to-Country Transfer of Patients and the Risk of Multi-Resistant Bacterial Infection by** Benjamin A. Rogers, Zohreh Aminzadeh, Yoshiro Hayashi, et. al., *Clinical Infectious Diseases*, Volume 53, Issue 1, 1 July 2011, Pages 49–56.

Healthcare officials should practice a non-judgmental approach to manage the intercountry patient with MRO infection. This is challenging for the physician to treat patients who believe the interventions they are looking for are inappropriate or unethical by the home treating clinician, such as commercial organ transplantation, or experimental or cosmetic procedures. Local, national, and international regulations regarding notification, transit, control of patients harboring MROs require to stop spreading further outbreaks. (Fidler, D. P., & Gostin, L. O. 2006)

Conclusion

It becomes a daily reality for health professionals to treat patients transferred from other countries. The patient presents with various forms of medical issues to healthcare institutions. On some occasions, it is challenging for hospital authority to identify the details of the patient for recording purpose and requires specific questing. Besides, communication barriers cause additional difficulty for gathering patients' information regarding medical care in another country. Our advance molecular technology has given us considerable insight about emergence and dissemination of healthcare associated antimicrobial resistant organisms. The intercountry patient acquires a wide range of MRO. This review illustrated only the currently significant issue in a small extent. A lot more things need to be delved deeper. However, main concept is the dynamicity of the outbreaks.

Furthermore, new data suggest that now MROs has reached to those who did not have contact with health care settings at the time of travel to endemic country. These emerging data demand further exploration in this field to get a clear picture about potential risk factors and magnitude of the problems.

In conclusion, antimicrobial resistance has become a global issue requires response from local to international level. Obviously, there are lot of factors that complicate the identification and management of the problems. First line defense for all patients is clinical vigilance with a high standard of baseline infection prevention practice. Besides,

surveillance systems are potential key to recognize origin and movement of resistant organism through epidemiological and molecular analysis. This information will surely help for developing publicly funded targeted interventions aimed at controlling antibiotic resistance globally.

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