TPM Vol. 32, No. S4, 2025
ISSN: 1972-6325
https://www.tpmap.org/

CHALLENGES AND SOLUTIONS FOR DISEASE PREVENTION IN MARITIME HUMANITARIAN OPERATIONS

K. KARTHIK[1], MANI RAJA KUMAR[2]
[1]DEPARTMENT OF NAUTICAL SCIENCE, AMET INSTITUTE OF SCIENCE AND TECHNOLOGY, CHENGALPET, TAMIL NADU - 603 305, principal@amet-ist.in, 0009-0008-2399-6249
[2]DEPARTMENT OF NAUTICAL SCIENCE, AMET INSTITUTE OF SCIENCE AND TECHNOLOGY, CHENGALPET, TAMIL NADU - 603 305, manirajakumar@amet-ist.in, 0009-0000-3971-8456

Abstract
Due to the diverse infectious disease hazards faced by cruise travelers, there are established guidelines for Preventing, Mitigating, and Managing (PMM) such diseases. Novel infections and crises require revised, contextually relevant recommendations and protocols. Recent evidence on PMM infection must be converted into directives for government agencies and the tourist shipping sector. Within the framework of the European healthy sailing task, the research performed a scoping examination of materials in PubMed, Scopus, and grey research to identify scientific papers, rules, instructions, and laws about infectious illnesses PMM in maritime ports, as well as on cruise, boat, mission, and river cruise vessels from 2000 to 2025. Out of 650 papers, the majority were peer-reviewed articles (58%) and technical advice (29%), next to reports/other documents (10%), business advice (4%), and regulations (2%). Fifty percent (51%) of all articles focused on respiratory ailments, while fewer tackled diarrhea (12%), Legionnaire's illness (7%), other vaccine-preventable illnesses (4%), mosquito-borne illnesses (2%), and sexually transmitted illnesses (2%). Most papers concentrate on infectious diseases in seagoing cruises (76%), in contrast to ferries, exploration vessels, and river cruise vessels (27%, 17%, and 18%). A limited number of publications focused on seaports (38%), shore-side employees (20%), and port towns (3%). Most literature was released between 2020 and 2025 (54%), with a notable surge in publications on respiratory conditions (270 articles). A trend in volume and type was noted about public health emergencies corresponding to the year of publication. Peer-reviewed publications and guidelines focus on pulmonary and gastrointestinal diseases, maritime cruise vessels, and their onboard inhabitants. There are deficiencies in several areas: various illness categories, different types of passenger vessels, terrestrial personnel, and port populations.
Keywords – Disease, Prevention, Maritime, Humanitarian

1. INTRODUCTION

Efficient mitigation, avoidance, and control of infectious diseases in passenger vessel travel necessitates a multisectoral strategy, employing proven methods executed by proficient professionals from passenger transport firms, government agencies, and other relevant parties [1]. Studies on infection management and containment in shipping environments must be converted into guidelines, rules, and laws, resulting in practices that are based on evidence. Guidelines, regulations, and rules and regulations for implementing Preventing, Mitigating, and Managing (PMM) in passenger vessels exist at regional, national, and worldwide levels [2]. Formerly unrecognized emergent infectious illnesses and novel public health crises can affect passenger travel.

In the past decade, multiple healthcare crises of global concern have impacted passenger transportation, notably Ebola virus illness, Zika virus illness, coronavirus illness (COVID-19), and mpox, formerly monkeypox [3]. Developing infectious diseases and healthcare crises necessitate current, context-specific protocols and procedures incorporating insights from prior experiences. In reaction to catastrophes, specialized recommendations are formulated based on unique pathogen attributes, clinical manifestations, epidemiological data, and modes of dissemination. Studies providing fresh proof on infectious illness PMM must be evaluated to revise and enhance recommendations [16].

The hazards of infectious diseases linked to passenger vessel travel are well acknowledged. Peer-reviewed articles detail epidemics of norovirus, COVID-19, swine flu, other vaccine-preventable diseases (VPDs), and Legionnaire's disease, with these outbreaks exacerbated by crowded settings, travelers from many origins, and shared sources of possibly contaminated food and drinking water. Disease and control of infections guidelines are derived from these articles [4]; therefore, analyzing data regarding the efficacy of interventions for infection PMM in particular circumstances is essential [18].

The difficulties encountered by health officials and the traveling shipping sector during COVID-19 have emphasized the necessity for evidence-based methods to avoid and manage infectious diseases in client ship transport. The European healthy sailing initiative seeks to implement effective VPDs and mitigation measures on big passenger vessels. This necessitates the collection of facts about infection transmission pathways on passenger vessels and establishing an initial understanding base to guide the creation of PMM interventions. A scoping study was performed to ascertain the breadth of literature regarding infectious illness, PMM, and cruise transportation [17][14]. The findings from the review were compiled into an online database for healthy sailing to utilize as a guide in the development of PMM standards. The scoping examination sought to address the inquiry: what is the existing research, rules, recommendations, and legislation regarding infectious illnesses PMM in big passenger vessels and at seaports globally? This research presents a comprehensive summary aggregating paper pertinent to infectious illness PMM and customers in travel, deemed beneficial for the healthy sailing initiative, investigators, customer shipping firms, and other appropriate regulators [19].

2. METHODS

A scope review methodology has been developed and is available upon request from the appropriate author. This evaluation used the Preferred Reporting Items for Strategic Review and Meta-Analyses extensions for scoping studies (PRISMA) [5].

2.1 Criteria for eligibility

Eligible articles pertained to preventing, reducing, or handling any infectious illness among human travelers associated with cruise ships or maritime ports. Articles were omitted if they addressed seafarer wellness, shore-side personnel, or disease prevalence if the kind of vessel could not be identified; just vector monitoring at entry ports; or historic maritime transit [6][21]. Passenger vessels were categorized in the article as cruise ships, ferries, river cruise vessels, or expedition-type vessels. Expedition-type ships are characterized as "cruise boats," "passenger arteries," "expedition arteries," or "luxury boats" operating for prolonged durations in polar and isolated areas, when medical assistance necessitates evacuation that takes many hours or days. Publications addressing the psychological wellness of travelers or crew members, especially about contagious diseases, were deemed beyond the study's purview [15][20]. Articles mentioning non-passenger vessels (e.g., cargo, naval, study, or migration ships) were omitted. Unknown material about maritime transport, conveyances, or entrance places was considered. No restrictions were imposed on geography or publishing type. Documents in English published post-1990 were deemed admissible, while legislation or rules passed before 1990 but presently in effect were incorporated [10].

Sources of data included searches of the PubMed and Google databases conducted in February 2023. The gray literature was examined on the websites of regional and international bodies, the cruise ship business, marine health associations, national maritime officials, health departments, and transportation agencies. The European healthy entrances bibliographical tool and a prior search were examined, and any qualifying articles not found in the queries done in January 2025 were incorporated [13].

2.2 Search methodology and terminology

The queries were derived from the research and revised by the healthy sailing team [7]. The terms encompassed versions of three notions integrated with Boolean business owners: (i) sickness; (ii) environment; and (iii) community [12].

2.3 Examination of studies and selection process

Records have been imported into EndNote Library (version X7), eliminating duplication. Phase I screened titles and abstracts to confirm that records had been released in English post-1990 (except laws) and pertained to infections in human travelers [11]. Records that met phase I criteria progressed to phase II full-text analysis to verify their relevance to infectious diseases PMM associated with passenger vessel travel and ports of call. Two experts conducted the phase I and II screenings, while a third reader validated any uncertainties. Data that met phase II requirements were subjected to data graphing.

2.4 Data visualization

A template for gathering information was created. Two reviewers partitioned the data graphing; an additional reviewer corroborated ambiguities. The subsequent statistics were obtained from qualifying records: (i) publishing information; (ii) type of infectious illness; (iii) marine context; (iv) demographics; (v) geographical area; and (vi) public health interventions. A critical review was not conducted as the objective was to ascertain the breadth of current scholarship, regardless of its quality [9].

2.5 Data amalgamation

Data were classified according to the specific factors they covered [8]. The findings were further analyzed by year of release to discern publication patterns.

3. RESULTS

3.1 Reports Incorporated in the Assessment

Twenty-six articles and papers met the requirements for eligibility (Fig. 1). This study comprised eight recordings from the joint action database and one personal correspondence that indicated cases or epidemics of VPDs linked to ships.

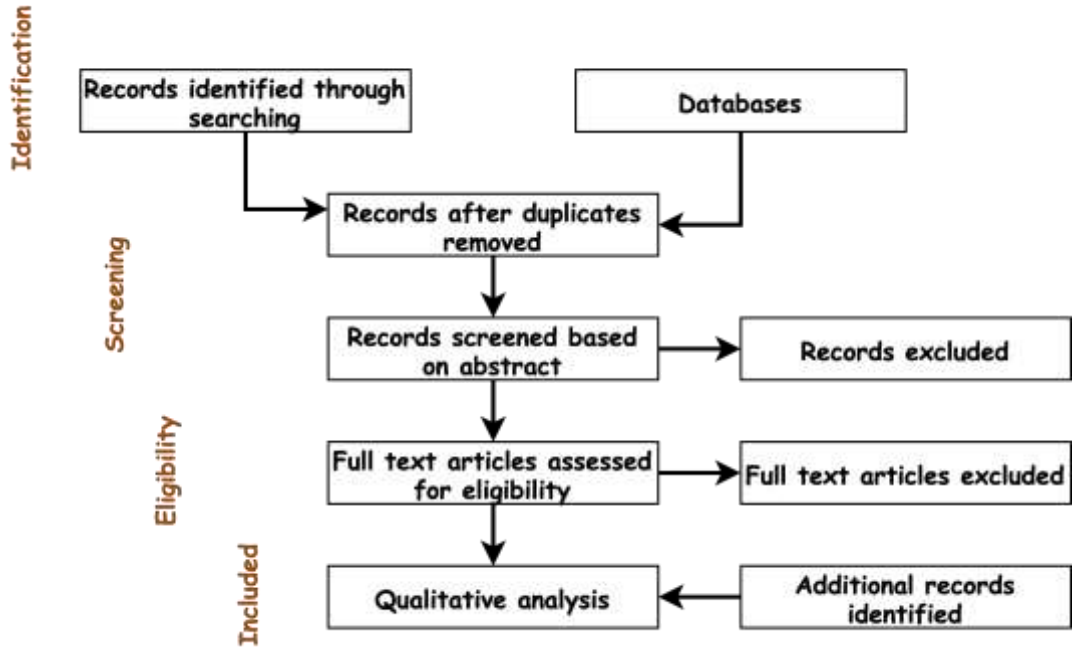

Fig. 1. Workflow of the study

The comprehensive assessment identified 25 incidents, comprising 18 epidemics and seven isolated cases, occurring on passengers, cargo, army, and work vessels between the beginning of January 2000 and 2025. The systematic examination included data from five studies that assessed records from vessels or agencies and four investigations that reported antigenic test findings of sailors.

A total of 1800 patients (120 epidemics, seven case notifications) were discovered, with most of them occurring among crew members (82%) and consisting of varicella infections (84%). Numerous reports indicate that the majority of crew illnesses are from subtropical regions. Measles (70% among staff), rubella (89% among staff), shingles (68% among staff), and varicella (88% among staff) were more prevalent among the staff. The incidence of mumps was identical among travelers and crew members, with 24 cases reported in each group. Hepatitis A (71%), meningococcal encephalitis (45%), and diphtheria were more prevalent among travelers.

3.2. Individual Case Summaries

Isolated instances were documented for diphtheria, hepatitis A, meningococcal encephalitis, and chickenpox aboard passenger vessels, as well as a bacterial encephalitis incidence from a military ship and varicella from containers. Sixty of the seven instances mentioned included crew members, with just one instance of the diphtheria instance, which was a customer. Aside from one death attributed to varicella, no more fatalities have been detected. The encephalitis and strep incidents were the only reported instances that required hospitalization.

The illness case discovered by a traveler was traced to an isolate distinct from the dominant widespread strain moving in the collapsed Soviet Union, indicating that the disease was likely contracted during the Baltic cruise. Response procedures were detailed in six of the seven papers. In the three instances of varicella, loneliness, case detection/active monitoring among the staff, and staff vaccination were implemented, and cases have been reported to the government. The therapy, cleansing/disinfection, and risk sharing were reported as measures implemented in response to a single varicella case. In reaction to the diphtheria scenario, antitoxin against diphtheria and medicines were administered to each affected individual and their immediate family. At the same time, acquaintances got prophylactic antibiotics and low-dose tetanus vaccine repeats. Meningitis is infections reported in isolation; chemoprophylaxis was administered to close contacts from the ship, and tracking of contacts was performed.

3.3 Constraints

Due to the abundance of qualifying articles, conducting a critical review proved impractical. The robustness of the gathered evidence foundation cannot be assured due to the uncertainty over the quality of the available research. Research was sourced from esteemed and respectable entities, including worldwide scientific

organizations, local scientific organizations, and government organizations. A restricted quantity of information has been gathered and characterized for each article. The collected data met the evaluation objectives and will bolster the healthy sailing initiative. The research recognizes that only material pertinent to the study, written in English and after 1990, was considered, resulting in the possibility of bias.

4. DISCUSSIONS

4.1 Evidence about infectious diseases

The findings indicate that, irrespective of publication type, the majority concentrated on respiratory disorders, whereas fewer addressed diarrhea and Legionnaire's illness. Fewer papers exist regarding other VPDs, vector-borne diseases, and sexually transmitted infections. This suggests that although these illnesses impact travelers and crew participants, they occur more rarely or highlight deficiencies in specific areas where scientific recommendations are necessary. Marine medical research indicates that respiratory ailments, such as influenza and COVID-19, are significant infections with epidemics documented across all types of passenger vessels. The effects of gastroenteritis, particularly on cruise ships, are extensively established through recorded epidemics. Additional infectious illnesses persist and impact passenger ship travelers. A thorough assessment detected outbreaks of VPDs on 13 cruise vessels and one ferry. The influence of VPDs reached neighborhoods, evidenced by subsequent cases of measles linked to a traveler from an onboard ship. Transmission of VBD cases across geographic regions has been noted through tourist ferry travel. A study of 22 cruise ships revealed insect, roach, bed bug, and lice infestations. An investigation of seafarer sexual habits revealed information deficiencies that elevate disease risks; approximately fifty percent of the surveyed crew engaged in secure behaviors with "occasional mates."

4.2 Evidence within a maritime context

Most studies have focused on maritime cruise ships, perhaps due to the nature of cruise travel, which involves prolonged close contact conversations, land-based trips, and shared food and water supplies, all of which elevate the risk of infection. The worldwide cruise industry is commercially significant, generating approximately $160 billion annually. Other commercial vessel categories offer substantial financial and societal benefits. In 2020, the worldwide ferry business generated $65 billion in the global economy, significantly impacting rural locations by providing connections, social assistance, and critical products.

The characteristics of various passenger vessels promote the introduction and dissemination of infections. Ferries conduct brief journeys, with people dispersing widely upon arrival at locations. Illness can only be identified by terrestrial facilities days after travelers get off, complicating the execution of effective PMM procedures.

Infections have been documented on tourist ferries, and the transmission of malaria and tick-borne illnesses has been noted between regions connected by boat services. Expedition vessels possess restricted access to healthcare resources on land and limited scientific diagnostic capabilities onboard, complicating efficient preventive medical management.

Infections among exploration ship travelers have been documented, with COVID-19 epidemics occurring in these environments. Outbreaks of respiratory illnesses and diarrhea have been reported on river cruise vessels. Shorter than ocean-going cruise vessels, they can accommodate multiple guests engaging in social events, including dining.

4.3 Population-based evidence

The findings indicated that more articles focused on passengers rather than crew for almost all forms of infectious diseases, except other VPDs and sexually transmitted infections. Although literature on occupational hazards is available, crew members spend prolonged durations onboard, increasing their likelihood of exposure to potential risks, including close contact with diseased individuals. It is essential to emphasize the efficacy of PMM procedures in light of the occupational hazards that the crew encounters.

There is a paucity of studies examining the effects of illness on shore-based staff or community groups regarding passenger ship transit. Before and throughout the COVID-19 pandemic, secondary infectious illness cases impacted terrestrial communities. A thorough assessment indicated more than 250 additional instances of measles on land associated with two ship epidemics. At the same time, a respiratory outbreak revealed four cases of influenza (H1N1) 2009 geographically connected to cruise guests. In contrast, cruise and adventure ship cruises frequently incorporate land-based activities; contingent upon the epidemiological circumstances on land, these communities pose a risk for the introduction of illness onboard. Additional retrospective research is required to evaluate the effects of passenger ship transit on terrestrial ecosystems and vice versa.

4.4 Evidence through PMM metrics

Regardless of the kind of vessel or illness being examined, most articles primarily concentrated on advising or implementing PMM interventions for travelers, rather than environmental interventions. The literature concerning PMM measures was mainly accessible to cruise ships compared to other categories of passenger vessels. This suggests insufficient evidence and direction regarding the efficacy of PMM techniques in tourist ferries,

expedition-style vessels, and river cruise liners. An obstacle for all passenger vessels is thoroughly evaluating the most successful PMM strategies. Outbreak studies frequently document the concurrent adoption of various regulations, complicating the assessment of each measure's unique significance. Results from journeys following a public health crisis are often undocumented or undetected, complicating the evaluation of the efficacy of steps implemented to curb a pandemic.

5. CONCLUSION

This scoping study found 650 articles concerning infectious illness PMM with tourist ship travel from 2000 to 2025. Despite the consistent rise in publication quantity, discrepancies were noted. Literature predominantly focuses on asthma, cruise ship environments, and onboard populations. Future studies should identify hazards and evaluate the efficacy of PMM measures regarding VBDs and other VPDs. The body of evidence might be enhanced to formulate guidelines for disease PMM specifically targeting ferry services, expedition vessels, river cruise vessels, and maritime ports. Additional study is required to ascertain how terrestrial ecosystems pose infectious risks onboard and how tourist ship transit affects these populations. Establishing rules for standardized data collecting and reporting on epidemic investigations aboard passenger vessels should enhance the comprehension of the efficacy of PMM interventions and their effects on land-based populations. The healthy sailing initiative performed this scoping examination to create an online literature database. The research will utilize results to perform an organized study that examines the incidence of infectious diseases, the impact of ship-borne illnesses on travelers and neighborhoods, hazards for the transmission of diseases, and the efficacy of PMM strategies across various types of cruise ships.

REFERENCES

1. Zhou, J., Chen, S. L. P., Shi, W. W., & Kanrak, M. (2023). Cruise supply chain risk mitigation strategies: An empirical study in Shanghai, China. Marine Policy, 153, 105600.
2. Ghate, A. D., Sandilya, R., Verma, M., & Chakraborty, P. (2024). Developing a framework for inclusive fisheries governance in India. International Journal of Aquatic Research and Environmental Studies, 4(S1), 89-94. https://doi.org/10.70102/IJARES/V4S1/15
3. Lange, K. W. (2021). Coronavirus disease 2019 (COVID-19) and global mental health. Global health journal, 5(1), 31-36.
4. Feifei, W. (2024). Optimization Algorithm of Public Service Facilities Layout in Earthquake-stricken Areas based on SA Algorithm. Archives for Technical Sciences, 2(31), 70–85. https://doi.org/10.70102/afts.2024.1631.070
5. Yao, L., Zhang, Y., Zhao, C., Zhao, F., & Bai, S. (2022). The PRISMA 2020 statement: a system review of hospital preparedness for bioterrorism events. International journal of environmental research and public health, 19(23), 16257.
6. Abdulkareem, A. (2022). The Impact of Strategic Improvisation on the Nature of the Strategic Choice for the Tourism Organizations - An Exploratory Study in the Iraqi Tourism Board. International Academic Journal of Science and Engineering, 9(1), 01–12. https://doi.org/10.9756/IAJSE/V9I1/IAJSE0901
7. Feletti, F., Brymer, E., Bonato, M., & Aliverti, A. (2021). Injuries and illnesses related to dinghy sailing on hydrofoiling boats. BMC sports science, medicine and rehabilitation, 13, 1-9.
8. Sargunapathi, R., Jeyshankar, R., & Thanuskodi, S. (2024). Bibliometric Analysis of Scientific Collaboration in Quantum Dots Literature. Indian Journal of Information Sources and Services, 14(2), 178–185. https://doi.org/10.51983/ijiss-2024.14.2.25
9. Bertheussen Karolius, K., Ad. Psarros, G., Astrup, O. C., Liang, Q., Van Welter, C., & Vassalos, D. (2022). Maritime operational risk management using dynamic barriers. Ships and Offshore Structures, 17(5), 1099-1113.
10. Akshyaa Raaja Shri, I. T., Dheenadhayalan, S., Rahul, B., Vishnu, B., & Suganya, S. (2023). Face Recognition Using LSTM in Image Processing. International Journal of Advances in Engineering and Emerging Technology, 14(1), 124–129.
11. Pennino, F., Fiorilla, C., Sorrentino, M., Armonia, U., Parisi, A., Mirizzi, P. D., ... & Nardone, A. (2023). Investigating awareness regarding travel-related infectious disease prevention in a metropolitan area. Tropical Medicine and Infectious Disease, 8(10), 476.
12. Modhugu, V. R. (2023). Efficient Hybrid CNN Method to Classify the Liver Diseases. Journal of Wireless Mobile Networks, Ubiquitous Computing, and Dependable Applications, 14(3), 36-47. https://doi.org/10.58346/JOWUA.2023.I3.004
13. Li, H., Meng, S., & Tong, H. (2021). How to control cruise ship disease risk? Inspiration from the research literature. Marine Policy, 132, 104652.

14. Carter, N. ., & Zhang, M.-L. (2025). An Investigation of the Relationship Between Population Change and Electoral Outcomes. Progression Journal of Human Demography and Anthropology, 2(1), 15-20.
15. Wondirad, A., Wu, K., Teshome, E., & Lee, T. J. (2023). What drives the consumption of cruise ship tourism? Analyzing factors that motivate visitors to participate in cruise ship holidays through a content analysis of selected journal publications. Cogent Social Sciences, 9(2), 2282411.
16. Martinez, R., & Garcia, C. (2024). Integrated Systems Design: A Holistic Approach to Mechanical Engineering. Association Journal of Interdisciplinary Technics in Engineering Mechanics, 2(4), 12-16.
17. Agarwal, A., & Yadhav, S. (2023). Structure and Functional Guild Composition of Fish Assemblages in the Matla Estuary, Indian Sundarbans. Aquatic Ecosystems and Environmental Frontiers, 1(1), 16-20.
18. Chinnasamy. (2024). A Blockchain and Machine Learning Integrated Hybrid System for Drug Supply Chain Management for the Smart Pharmaceutical Industry. Clinical Journal for Medicine, Health and Pharmacy, 2(2), 29-40.
19. Choudhary, S., & Reddy, P. (2025). Improving the Storage Duration and Improving the Characteristics of Tender Coconut Water using Non-thermal Two-phase Microfiltration. Engineering Perspectives in Filtration and Separation, 2(1), 7-12.
20. Armstrong, D., & Tanaka, Y. (2025). Boosting Telemedicine Healthcare Assessment Using Internet of Things and Artificial Intelligence for Transforming Alzheimer's Detection. Global Journal of Medical Terminology Research and Informatics, 2(1), 8-14.
21. Trisiana, A. (2024). A Sustainability-Driven Innovation and Management Policies through Technological Disruptions: Navigating Uncertainty in the Digital Era. Global Perspectives in Management, 2(1), 22-32.
22. Velliangiri, A. (2025). An edge-aware signal processing framework for structural health monitoring in IoT sensor networks. National Journal of Signal and Image Processing, 1(1), 18–25.
23. Abdullah, D. (2025). Environmental sound classification using CNNs with frequency-attentive acoustic modeling. National Journal of Speech and Audio Processing, 1(1), 8–14.
24. Arun Prasath, C. (2025). Performance analysis of induction motor drives under nonlinear load conditions. National Journal of Electrical Electronics and Automation Technologies, 1(1), 48–54.
25. Papadopoulos, G., Konstantinou, M., & Georgiadis, N. (2025). New Data on Cultural Preservation for Globalization Partners vs Traditional Tourism. Journal of Tourism, Culture, and Management Studies, 2(2), 1-11.
26. Radu, C. (2024). The Role of Innovation as a mechanism of enhancing Organizational performance. National Journal of Quality, Innovation, and Business Excellence, 1(1), 7-15.
27. Kavitha, M. (2025). Hybrid AI-mathematical modeling approach for predictive maintenance in rotating machinery systems. Journal of Applied Mathematical Models in Engineering, 1(1), 1–8.