Transformative impact of the COVID-19 pandemic on medical tourism*

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For citation: Grudtsyn, N. A. (2024). Transformative impact of the COVID-19 pandemic on medical tourism. *Vestnik of Saint Petersburg University. Earth Sciences*, 69 (4), 646–666.
https://doi.org/10.21638/spbu07.2024.403

This study aims to analyse the impact of the COVID-19 pandemic on global tourism and the medical tourism industry in particular. An interdisciplinary approach, incorporating mixed research methods, is employed. The quantitative analysis relies on data from the UN World Tourism Organization and the World Bank, while the qualitative analysis involves a review of literature and case studies. The results indicate a significant decline in tourist flows by country in 2020, followed by complex and multidirectional dynamics in 2021. Clustering reveals different trends in tourist flows in various countries and regions, providing a basis for future research. The heterogeneity of the dynamics of tourist flows is linked to the individual adaptation of the tourism sector in different countries to the new nature of transport links and the landscape of healthcare and services. In particular, the emergence of vaccine tourism represents a separate and unique niche, reflecting the changing priorities of medical tourists and a new geopolitical trend. The study compares the countries' rankings in the Medical Tourism Index (MTI) and the COVID-19 mortality rate and concludes that the MTI ranking may be a marketing tool but does not reflect the robustness of the healthcare system in the event of global crisis events. The study examines the psychological and socio-economic impacts of the pandemic on tourism, highlighting the growing importance of mental health in ensuring holistic well-being. The impact of digital technologies on tourism is revealed. The use of the "phygital" approach concept is proposed for hybrid medical tourism.

Keywords: public health, tourist flows, trends, hybrid medical tourism, phygital approach, tourist behaviour, clustering, comparative analysis.

1. Introduction

The COVID-19 pandemic contributed to an unprecedented downturn and brought unforeseen challenges to global tourism. The closure of international borders and the imposition of widespread travel restrictions have led to a steep fall in demand. Tourism economies, especially those heavily dependent on international visitors, found themselves in a state of distress as tourism revenues plunged while COVID-related expenditures rose sharply. Before the pandemic, tourism was a cornerstone of the global economy, accounting for 10.4% of global GDP, which is $ 10.3 trillion and 10.5 % of all jobs[1]. The whole world witnessed a collapse in interna-

* The research was funded by the Russian Science Foundation grant no. 23-28-00279 "Development trajectories of the medical tourism market in the context of reformatting the world order".

[1] WTTC (2023). Travel and Tourism Economic Impact. [online] Available at: https://wttc.org/research/economic-impact [Accessed 01.11.2023].

tional travel, with tourist arrivals diminishing significantly (Kumar and Ekka, 2023), dealing a substantial blow to tourism-dependent economies[2]. The UNWTO reported a 73 % decline in international tourist arrivals in 2020, equating to an estimated loss of $ 1 trillion in export revenues — a figure surpassing 11 times the loss incurred during the 2009 global financial crisis[3]. Over the last 30 years, the most significant reduction in international inbound tourism was caused by the COVID-19 pandemic, followed by the class of causes of "military-political conflicts", with the economic class coming in third (Grudtsyn, 2024).

The pandemic's impact has been comprehensive, affecting not only economies but also livelihoods, public services, and behaviour patterns. At this stage, as we face the path to recovery, the tourism industry requires a strategic and coordinated approach to regain its prominence and promote sustainable development in the post-pandemic era. Additionally, it is crucial to remain vigilant and prepared for potential new challenges. Building resilience and adaptability into the industry's framework will be key to ensuring its long-term sustainability and ability to thrive in an increasingly unpredictable world. The authority must also define the dynamics and strategic directions for the preservation of public health, ensuring a resilient response to current and future health challenges (Chistobaev et al., 2019).

The OECD's analysis of tourism policy responses highlights some diverse strategies that nations have employed to navigate this crisis[4]. It is important to examine early evidence of COVID-19's impact on travel modalities such as flights, cruise ships, and accommodations, which were profoundly affected in the pandemic's initial stages (Chang and Wu, 2021).

We aim to analyse the extent of the disruption while highlighting emerging trends and adaptations within the sector. The impact of COVID-19 on global tourism encompasses direct health-related concerns as well as wider socio-economic strategies that collectively enforce a state of dormancy upon the industry (Bausch et al., 2021) or an overview of the model performance in the COVID-19 pandemic and post-pandemic era (Ghasemi et al., 2021). While this study implies a global scope, strategy development requires consideration of country-specific characteristics, a topic addressed by numerous research studies (Kosaka et al., 2021; Okasha et al., 2023; Seo and Kim, 2021; Folinas et al., 2021).

In recent years, one of the distinct trends in the tourism industry has been the focus on enhancing mental health through travel experiences. Research by Buckley (Buckley, 2019; Buckley, 2023) highlights the therapeutic effects of nature and tourism on mental health, suggesting that time spent in natural environments and participating in tourism activities can significantly improve mood and reduce stress levels. According to Buckley and Brough (Buckley and Brough, 2021), protected natural areas hold significant economic value due to their positive impact on visitors' mental health. This finding emphasises the importance of preserving natural landscapes as a means to improve public health.

[2] IMF (2020). Tourism-dependent economies are among those harmed the most by the pandemic. [online] Available at: https://www.imf.org/en/Publications/fandd/issues/2020/12/impact-of-the-pandemic-on-tourism-behsudi [Accessed 06.09.2023].

[3] UNWTO (2022). COVID-19: Measures to Support Travel and Tourism. [online] Available at: https://www.unwto.org/tourism-data/covid-19-measures-to-support-travel-tourism [Accessed 01.11.2023].

[4] OECD (2020). Rebuilding tourism is a priority, but the sector must become more sustainable and resilient in the future. [online] Available at: https://www.oecd.org/coronavirus/policy-responses/rebuilding-tourism-for-the-future-covid-19-policy-responses-and-recovery-bced9859/ [Accessed 06.08.2023].

Research by Hu and colleagues (Hu et al., 2023a; Hu et al., 2023b) explored the role of tourism in enhancing mental health and the health of the elderly. Their work underscores the importance of integrating mental health considerations into travel planning, opening new perspectives for the development of the tourism industry.

The study by Godovykh and Ridderstaat (Godovykh and Ridderstaat, 2020) shows that tourism development can have a substantial impact on the health of residents in tourist regions, indicating the need to consider the effects of tourism on local populations when planning and developing tourist destinations. First of all, tourism development often leads to infrastructure improvements, such as medical facilities and public transportation, enhancing access to healthcare services and improving residents' quality of life. Secondly, tourism contributes to regional economic growth by creating jobs and increasing local incomes. Thirdly, tourism development can also attract investments in medical facilities and technologies that can enhance the quality of medical services.

However, there are also some negative impacts, such as health risks to residents or economic inequality. Tourism can introduce the spread of infectious diseases, especially in destinations with inadequate healthcare infrastructure. Tourism development may also exacerbate economic inequality by benefiting only certain sectors or individuals, leading to disparities in access to healthcare and other essential services. Residents in low-income areas may face barriers to healthcare access due to rising costs or inadequate public services. Rapid tourism development could lead to social and cultural disruptions, potentially causing stress and displacement among local communities. Displacement due to tourism infrastructure projects or rising property prices can have negative effects on residents' mental health and social well-being. Possible positive and negative impacts are important during the planning and executing phases of the development of medical tourism infrastructure, including the creation of medical tourism clusters (Grudtsyn and Chistobaev, 2023).

Studies by Gillovic et al. (Gillovic et al., 2021) and Ali et al. (Ali et al., 2022) underscore the need for a more inclusive approach in the tourism industry, one that not only recognises the diverse needs of tourists with intellectual and cognitive disabilities but also actively works towards creating environments and experiences that support their mental and physical well-being. Their findings highlight the importance of creating inclusive and accessible tourism experiences that cater to the diverse needs of all tourists, emphasising the role of empathy and understanding in designing tourism offerings. This inclusive approach not only benefits tourists with specific needs but also enriches the tourism industry as a whole, making it more diverse, empathetic, and human-centred. The study (Levi et al., 2018) corroborates that vacations and tourism can reduce symptoms of depression and improve mental well-being, suggesting opportunities for tourism companies to create specialised programs aimed at improving mental health.

COVID-19 has revealed a clear trend towards recognising and utilising tourism as a tool for improving mental health, which opens new areas for research and development in the tourism industry. We're not just talking about tourism as an industry, but particularly its significance in medical tourism. Considering that health is a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity[5], integrating mental health into medical tourism strategies becomes crucial. This approach aligns

[5] WHO (2005). Constitution of the world health organization. [online] Available at: https://apps.who.int/gb/bd/PDF/bd47/EN/constitution-en.pdf?ua=1 [Accessed 01.11.2023].

with the holistic understanding of health, emphasising the importance of mental wellness as a vital component of overall health and the unique role that medical tourism can play in achieving this balance.

2. Methodology

This research employs a mixed-method approach to provide an in-depth and comprehensive analysis of the COVID-19 pandemic's impact on global tourism flows. The methodological foundation of this study is informed by a synthesis of existing literature and empirical data analysis, ensuring a robust understanding of the pandemic's multifaceted effects on the tourism sector.

The research methodology is grounded in a thorough literature review, analysing scholarly articles and reports that detail the effects of COVID-19 on the tourism sector globally. This includes studies by scholars who have explored the pandemic's impact on medical tourism (Semenova et al., 2021; Seo and Kim, 2021; Kim and Hyun, 2022; Chhabra et al., 2021; etc.).

A significant portion of our methodology involves utilising secondary data sources. This encompasses international tourism statistics from reputable organisations, including the World Bank and national tourism bodies. The quantitative data is rigorously analysed to identify trends and changes in tourism flows, focusing on comparing pre-pandemic (2019) and pandemic (2020–2021) periods. This comparative analysis provides a measurable insight into the pandemic's impact.

The data sets from the World Bank[6] and UNWTO[7] have several notable features. The World Bank's database for the year 2020 includes data from only 132 countries and territories and no information about the 2021 year. To gain a more complete and current perspective, we merged data sets from the World Bank, UNWTO and other sources. These datasets are not entirely comprehensive in detailing the different approaches to calculating the number of tourist arrivals, including variations in whether both day-trip and overnight visitors are included in the overall figures, which raises concerns about data uniformity and comparability across different countries. With access to data from international organisations, we seized the opportunity to examine territories in addition to countries, such as the special administrative regions (SAR) of China or the West Bank and Gaza. This inclusion broadens the range of available analytical insights.

Python language (with the pandas, matplotlib, kMeans and other libraries) was used via the Jupyter Notebook as a tool for quantitative data analysis. We used K-means clustering as the algorithm. It involves grouping a set of objects or data points in such a way that objects in the same group are more similar to each other than to those in another group. Tableau au Desktop 2023 was used as a tool for constructing cartographic materials.

In the article, it is assumed that the decrease in the number of medical tourists is correlated with the overall decline in tourist numbers by country. This assumption is applicable mostly due to the lack of official comprehensive statistics.

[6] World Bank (2023). International tourism, number of arrivals. [online] Available at: https://data.worldbank.org/indicator/st.int.arvl [Accessed 10.12.2023].

[7] UNWTO (2023). 145 key tourism statistics. [online] Available at: https://www.unwto.org/tourism-statistics/key-tourism-statistics [Accessed 10.12.2023].

3. Results

3.1. Medical tourism and COVID-19 pandemic

As we mentioned earlier, there is an issue with the lack of explicit accounting for medical tourists in the UNWTO or any other international organisation. There was a publication titled Exploring Health Tourism, published by ETC/UNWTO[8], which aims to provide a better understanding of the growing segment of wellness and medical tourism, but it was published in 2018, and there is no current and constantly updated statistical open-access database for countries of the world that would reflect the state of flows of medical tourists. Therefore, to assess the dynamics, data on the total number of tourists arriving in the country are used. To validate this approach, we compare the decrease in four countries (Table 1) between the total tourist arrivals and the number of medical tourists.

Table 1. **Comparison of the decrease in total tourist flows and medical tourists**

Country name	Total number, thousands, 2019	Total number, thousands, 2020	Decrease, %	Medical tourists, thousands, 2019	Medical tourists, thousands, 2020	Decrease, %	Medical/total decrease, %
Malaysia	26,101	4333	–83.40	1220	689	–43,44	52
South Korea	17224	2516	–85.39	497	117	–76,46	89
India	17754	6291	–64.57	700	183	–73,86	114
Germany	39563	12449	–68.53	97.3	65.5	–32.68	48

Source: Statista (2024). Actual number of medical tourists travelling to South Korea 2009–2022. [online] Available at: https://www.statista.com/statistics/1101345/south-korea-actual-number-of-inbound-medical-tourists/ [Accessed 20.11.2023]; Laingbuissonnews.com (2022). Germany: hospitals hit by international patient drop. [online] Available at: https://www.laingbuissonnews.com/imtj/news-imtj/germany-hospitals-hit-by-international-patient-drop/ [Accessed 19.10.2023]; MHTC. Healthcare Traveller Statistics. [online] Available at: https://www.mhtc.org.my/statistics/ [Accessed 18.10.2023]; Statista (2023). Number of inbound foreign medical tourists in India 2009–2021. [online] Available at: https://www.statista.com/statistics/914089/india-number-of-inbound-foreign-medical-tourists/ [Accessed 04.09.2023].

The results indicate that in all cases, there is a positive relationship between the decrease in total tourist flow and the flow of medical tourists. The minimum value is observed in Germany, where the decrease in medical tourism accounts for 48 % of the total tourist flow, while the maximum value is observed in India (114 %). Such significant variation necessitates closer attention to assessments of medical tourism at the country level.

In Germany, South Korea, and Malaysia, despite a significant decrease in absolute numbers, the ratio of medical tourism has increased as a proportion of tourist flow (see Fig. 1). This trend may suggest medical tourism as a potentially more sustainable form of tourism in certain countries during the crisis.

When analysing and evaluating the flow of medical tourists during the pandemic, it must be said that the sector experienced opposing effects: on the one hand, there was a

[8] World Tourism Organization and European Travel Commission (2018). Exploring Health Tourism — Executive Summary (UNWTO). Madrid. https://doi.org/10.18111/9789284420308

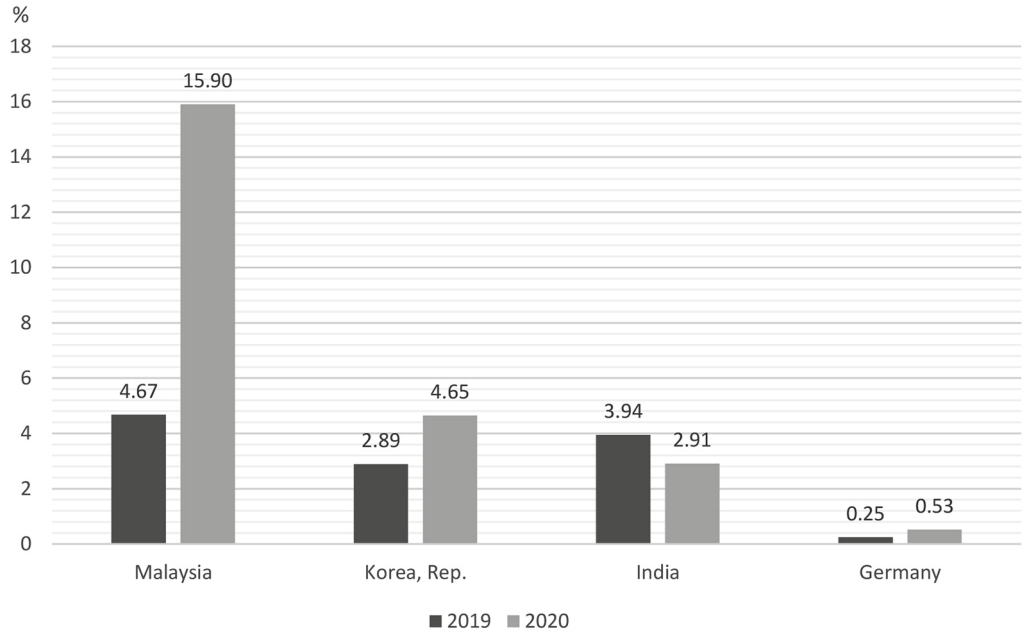

Fig. 1. Share of medical tourists by countries in 2019 and 2020

sharp reduction in the number of medical tourists seeking traditional treatments, and on the other, the emergence and high demand for so-called "vaccine tourism" (Kaewkitipong et al., 2021; Forman et al., 2021). Today, it's still challenging to predict the long-term trends of medical tourism after the pandemic. It is likely that this sector will experience rhythmic development and will require considerable time and effort to restore previous trends of international tourist activity. However, as for domestic tourism, it is gaining additional development impulses in the changing conditions and may, to some extent, compensate for losses from the reduction in the scale of international tourism.

One of the conditions for its solution is the formation of collective immunity in the population through vaccination. The concept of vaccine tourism is taking on significant economic and geopolitical importance in the face of future pandemics. For the few countries capable of short-term development of effective medical drugs, vaccine tourism could become a strategic factor, influencing not only health policies but also international relations and national security strategies. It may also affect global mobility, bilateral agreements, and foreign policy priorities as nations navigate the complex interplay of public health and international diplomacy. Especially important for the establishment of vaccine tourism is effective medical management. In the broadest sense, it boils down to the management of, firstly, the production-economic activities of state organisations in the healthcare sector; secondly, the management of the production of vaccines.

The COVID-19 pandemic has fundamentally altered our perception of many aspects of life, particularly mental health, and its impact on the field of medical tourism has been significant. The pandemic not only highlighted the vulnerabilities in global health systems but also brought to the forefront the importance of mental well-being. As people worldwide grappled with isolation, anxiety, and stress brought on by lockdowns and health

fears, there was an increased focus on the need for mental health support. This shift in perspective led to a rise in the demand for medical tourism destinations that offer holistic health services, including mental health. Destinations were known for their wellness, and therapeutic services saw a surge in interest as individuals sought ways to recover from the mental toll of the pandemic. Medical tourism, traditionally focused on physical health treatments, began to integrate more mental health and wellness programs, responding to this growing need. This integration signified a broader understanding of health, recognising the deep interconnection between physical health and mental well-being, accelerated by the unique challenges posed by COVID-19.

Outdoor tourism, which includes activities like hiking, nature walks, and wellness retreats, has been recognised for its therapeutic benefits, offering a much-needed escape and a way to cope with the stress and anxiety of the pandemic (Buckley and Westaway, 2020). This form of tourism has become a crucial component in the broader narrative of COVID-19 recovery, highlighting the therapeutic power of nature and the outdoors in restoring mental well-being.

3.2. Regional and country-specific features

Analysis of World Bank and UNWTO datasets shows that in 43 countries and territories, the decrease in the number of tourists was more than 80% (Table 2), and in 112 — more than 70 %, and 157 — more than 50 % (Fig. 2). The magnitude of the crisis within the tourism sector underscores the industry's vulnerability. In 2021, the situation changed and was characterised by opposing trends in different groups of countries and territories (Fig. 3).

We iteratively experimented with three clusters (Figs 4–5) but decided to increase the number to five (Figs 6–7), as this provided more meaningful insights and offered a broader analytical foundation for understanding tourist flow dynamics. The two originally existing clusters were each divided into two parts based on the degree of decrease or increase in the number of tourists. The most negative situation is primarily observed in countries in Asia and Oceania (Fig. 8).

Table 2. **Decrease in the number of tourists in the top 20 countries and territories in 2020**

№	Country	Decrease, %	№	Country	Decrease, %
1	American Samoa	–95.31	11	West Bank and Gaza	–86.48
2	Hong Kong SAR, China	–93.62	12	Montenegro	–86.02
3	Bermuda	–93.61	13	Singapore	–85.66
4	Bhutan	–90.57	14	South Korea	–85.61
5	Mongolia	–89.50	15	Macao SAR, China	–85.04
6	Namibia	–88.67	16	Solomon Islands	–84.78
7	Taiwan RPC	–88.39	17	Comoros	–84.48
8	Chad	–87.16	18	North Macedonia	–84.43
9	Japan	–87.09	19	Canada	–84.37
10	Samoa	–86.63	20	Tuvalu	–83.78

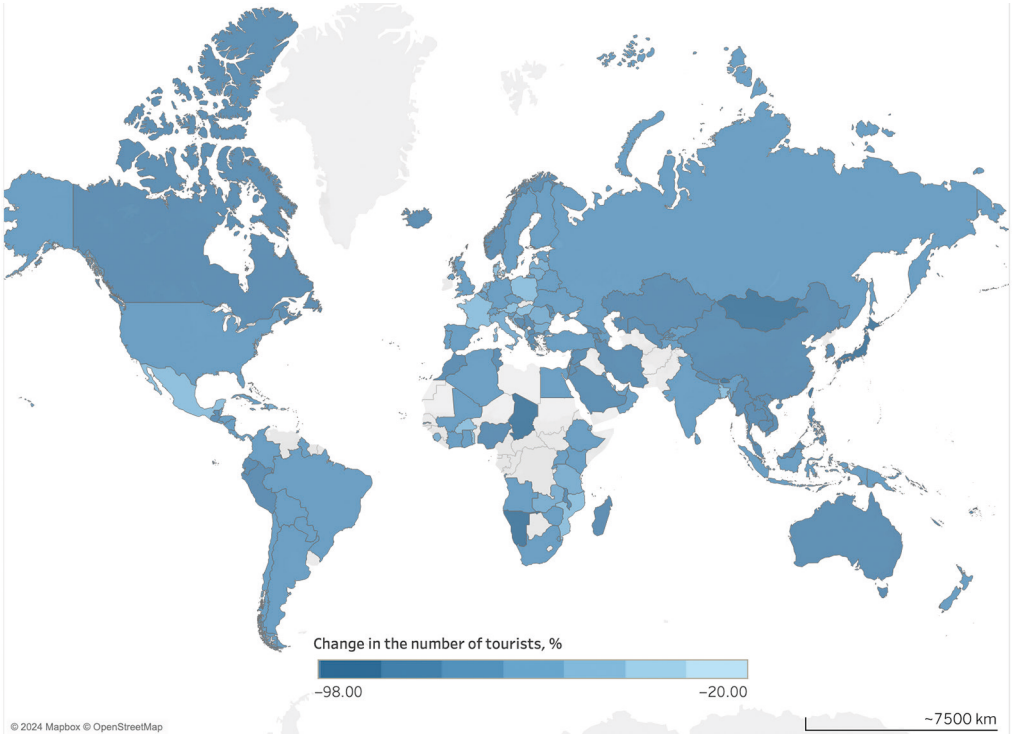

Fig. 2. Decrease in the number of tourists by countries in the 2020 year

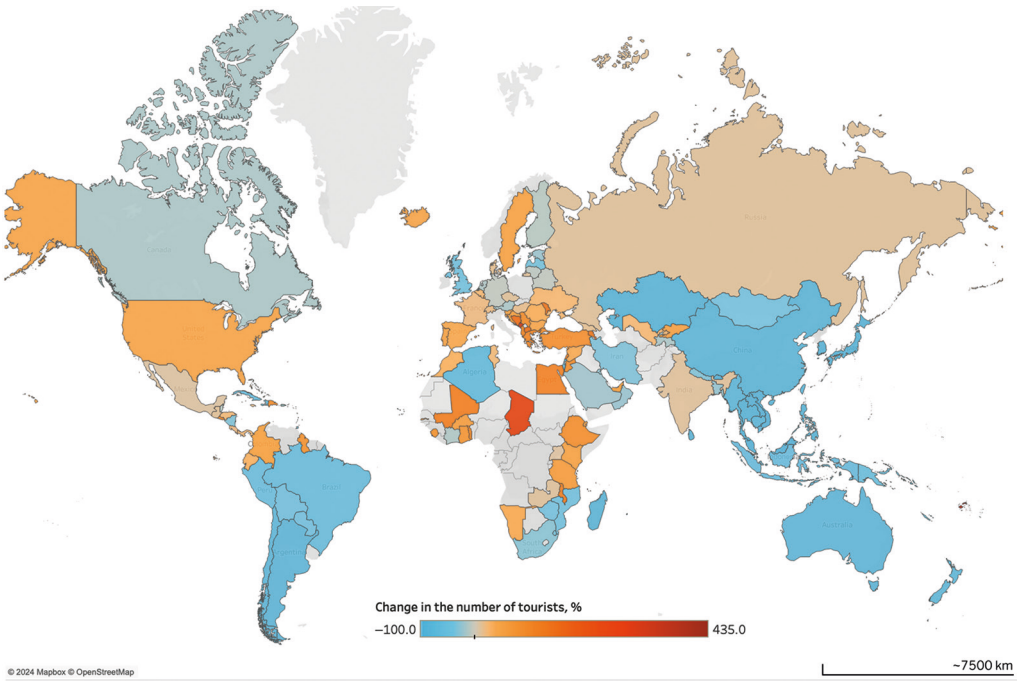

Fig. 3. Dynamics in the number of tourists by countries in the 2021 year

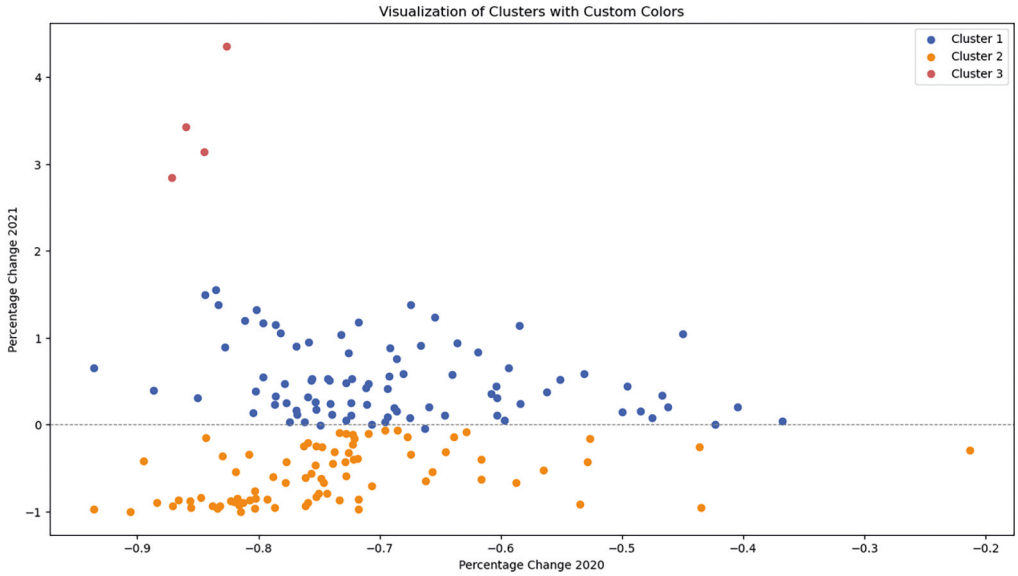

Fig. 4. Clustering of tourist flows using KMeans (3 clusters)

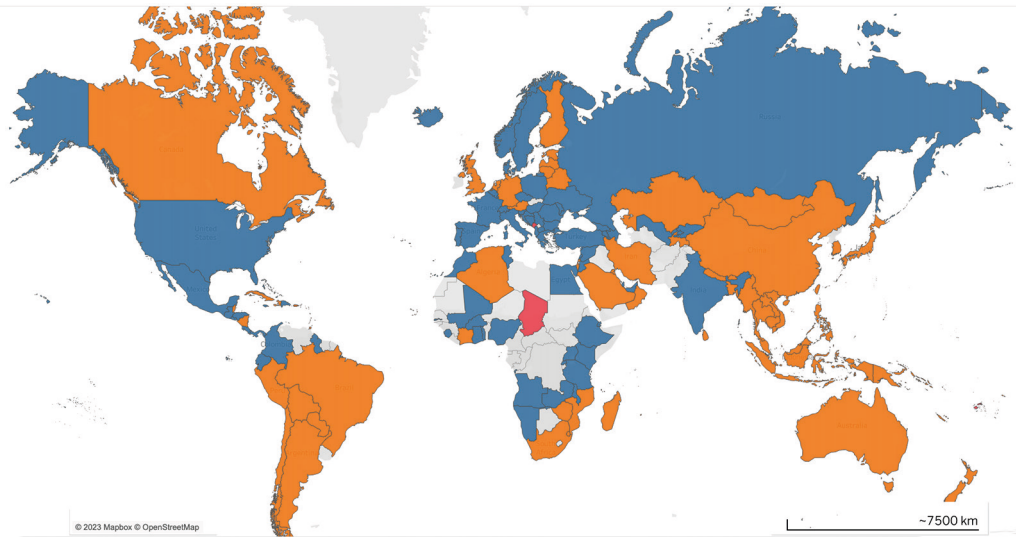

Fig. 5. Countries based on the KMeans clustering (3 clusters)

Data analysis revealed that almost half of the countries and territories (84 countries in clusters 1 and 3) experienced a decline in tourist flows in 2020 and also didn't show any sign of recovery in 2021. Cluster 2 shows a decline in 2020 with a significant level of recovery in 2021, while Cluster 5 indicates a considerable decrease in 2020 with a moderate level of recovery in 2021. Cluster 4 shows countries that had a substantial drop in 2020 but huge growth in 2021. The most positive scenario was in Fiji, where the drop in 2020 year was 82.66 % and an increase of 435.71 % in 2021. Despite this significant rebound, the re-

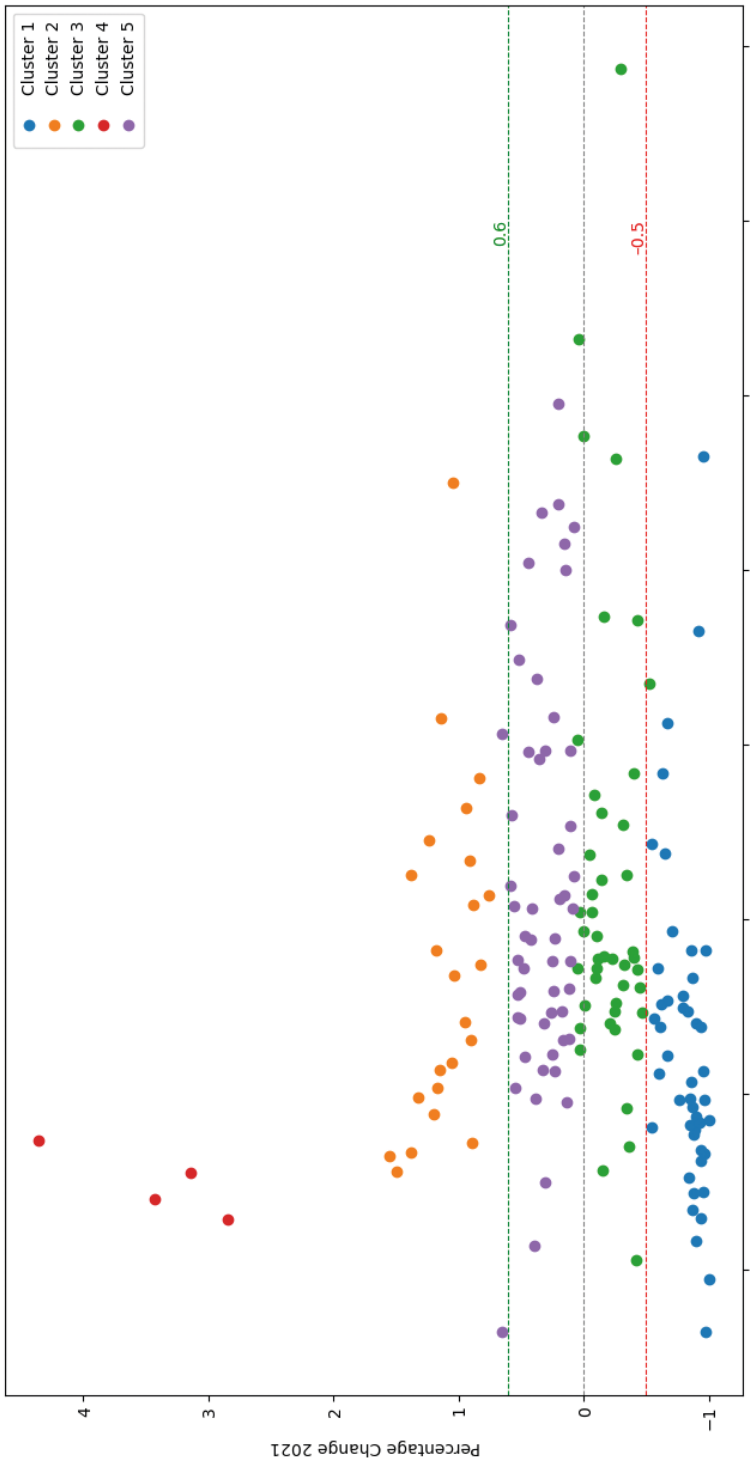

Fig. 6. Clustering of tourist flows using KMeans (5 clusters)

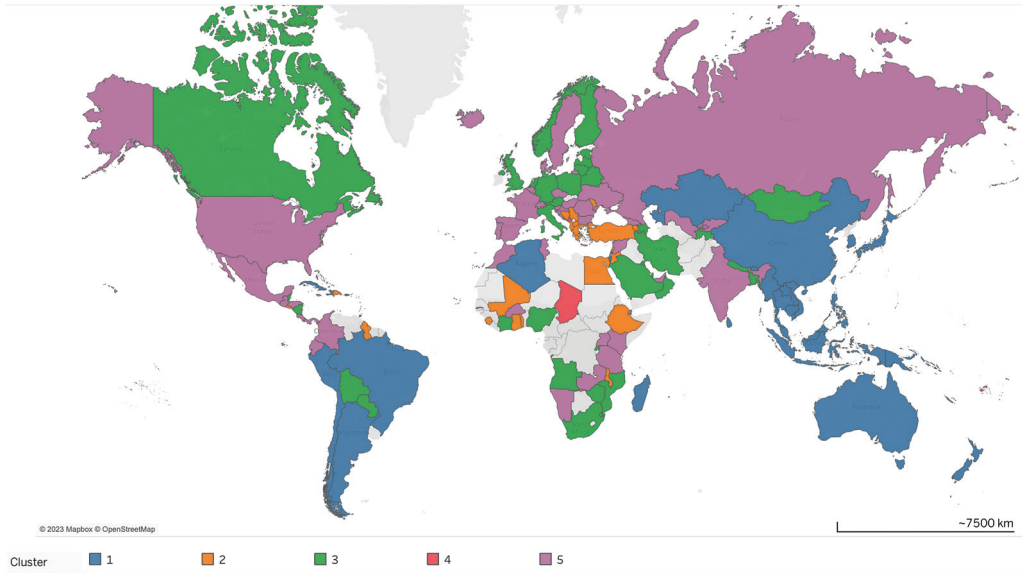

Fig. 7. Countries based on the KMeans clustering (5 clusters)

covery was still incomplete, reaching only 92.9 % of the pre-pandemic level. Here are some of the projects that helped lead to this result[9]:

1. Fiji's "Bula Bubble" travel corridor with Australia and New Zealand enables a safe "Vacation in Paradise" (VIP) experience for Aussies and Kiwis, who make up close to 70 % of visitors. The VIP Lanes initiative facilitates safe tourist movement throughout their stay, minimising COVID-19 transmission risks.

2. "Pacific Pathways" — air travel connectivity with Tuvalu, Kiribati, and Tonga facilitated through Fiji's national carrier.

3. Safe "Blue Lanes" protocols for yachts and pleasure crafts.

4. "The Love our Local" campaign promoting domestic tourism.

5. Financial aid for tourism businesses, including the removal of the 6 % Service Turnover Tax and a 50 % reduction in the Environment and Climate Adaptation Levy.

6. Allocation of $ 40 million to bolster healthcare infrastructure and resources, including procurement of medical supplies, personal protective equipment, and establishment of isolation facilities (by Ministry of Health and Medical Services).

Countries heavily relying on tourism, such as **France, Spain, Thailand, and the Philippines,** felt the brunt of the pandemic. If Western European countries belong to the fifth cluster of nations that, following a sharp decline in tourist flow, experienced a medium recovery in demand, then Southeast Asian countries continued to face a decrease in the number of tourists in 2021.

An interesting case is the rapid recovery of **Armenia's** tourism flow can be attributed to several factors, including an increase in tourists from Russia and direction directly related to the research question — vaccine-related travel. As Armenia offered free COVID-19 vaccines

[9] UNWTO (2022). COVID-19: Measures to Support Travel and Tourism. [online] Available at: https://webunwto.s3-eu-west-1.amazonaws.com/s3fs-public/2020-06/asia-and-the-pacific.pdf [Accessed 20.12.2023].

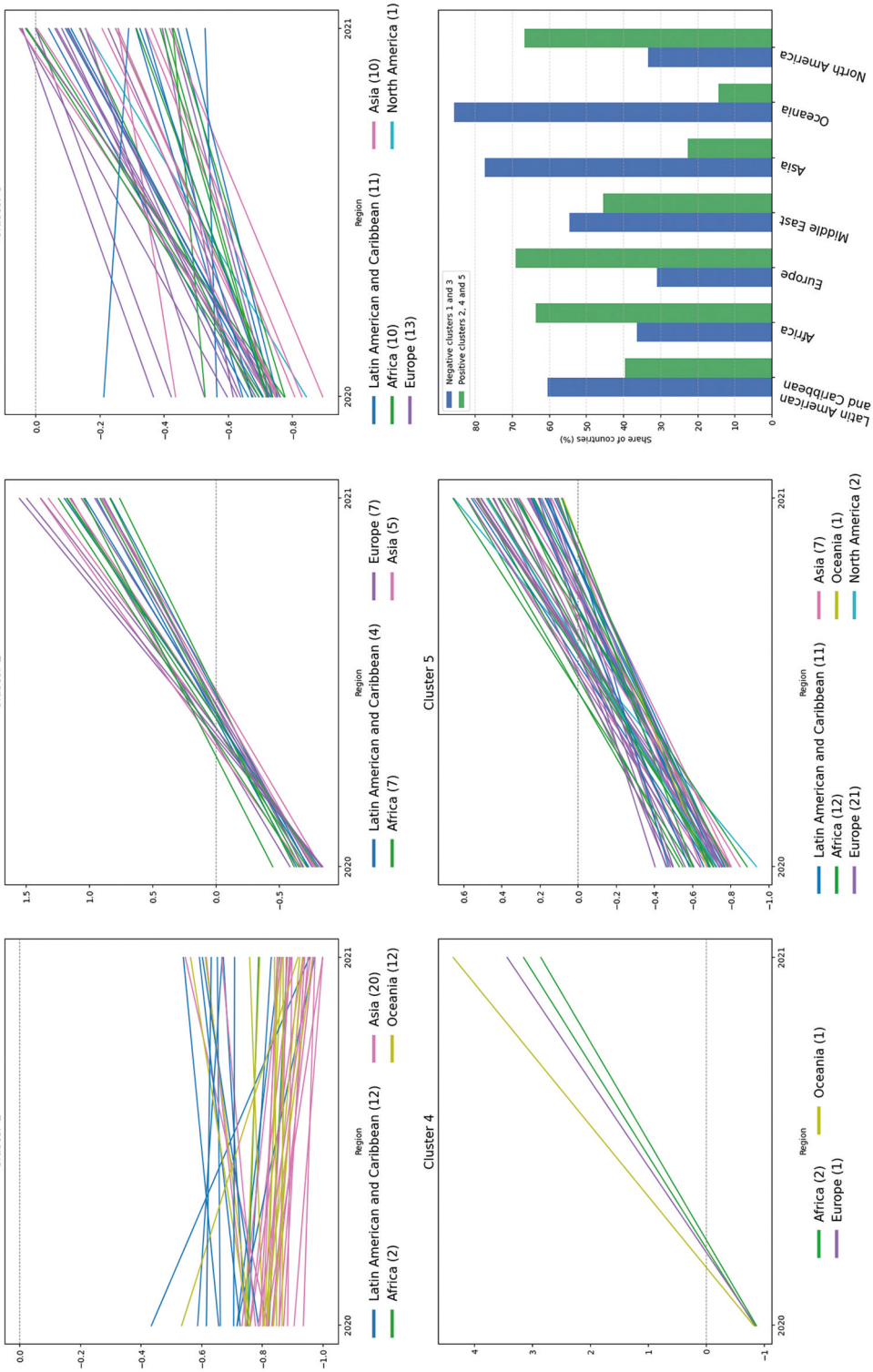

Fig. 8. Dynamics of tourist flows in 2020–2021 by regions in different clusters

to foreign visitors, it attracted many from neighbouring countries facing vaccine shortages, like Iran[10]. This unexpected surge in vaccine tourism provided a boost to the local travel agencies and the tourism sector as a whole. Moreover, broader sanctions on Russia could potentially affect Armenia's tourism, but the country has seen a gradual recovery in tourism post-2020, suggesting resilience and adaptability in its tourism strategies.

Clustering shows that **East and Southeast Asian** nations, along with **Australia, New Zealand, and South American** countries, have experienced similar patterns. The robustness of healthcare systems played a key role in managing the pandemic and, by extension, in stabilising the medical tourism sector. Countries with advanced healthcare infrastructure, like **Singapore and South Korea**, were better positioned to handle the influx of medical tourists once travel restrictions eased compared to those with less developed healthcare systems. Countries known for their medical tourism, leveraging their healthcare resources, were able to redirect these resources towards aiding the sick and achieved low mortality rates.

The clusters form a base for an in-depth exploration of functional, regional, and country-specific characteristics, which are only briefly discussed here, necessitating further exploration. Recognising the need for context-specific solutions, and after reviewing examples of individual country strategies in Fiji, we have chosen not to develop common strategies for each cluster. Effective strategies must be comprehensively crafted to address the distinct challenges and opportunities present within each country or region's social, economic, and political environment.

3.3. Medical Tourism Index

In the present study, we applied the Medical Tourism Index (MTI), a multifaceted metric developed by the International Healthcare Research Centre, to investigate the correlation between a country's ranking and its mortality rates (Table 3). Countries like Singapore and Japan, which have high medical tourism indices, have managed to maintain low COVID-19 death rates per million. The use of resources intended for medical tourists may allow (in addition to prompt and strict administrative policies) to prevent overloading of the healthcare system. In contrast, the United Kingdom, with a relatively high MTI ranking, has a high death rate per million, suggesting that a strong medical tourism index does not necessarily correlate with better pandemic outcomes. There is a notable disparity in death rates per million infected across these countries, which could be influenced by factors such as the quality of healthcare, public health policies during the pandemic, and the demographic profile of the population.

A correlation matrix was generated (Fig. 9), however, attempts to construct clusters based on data from mortality rates, tourist flows, and the Overall MTI Ranking were unsuccessful. Clusters were formed based on changes in the MTI but not on the aggregate of the presented information.

These findings suggest that the Overall MTI Ranking may be used as a marketing tool, failing to accurately reflect the situation during crisis events. Consequently, its utility in guiding policy decisions should be critically evaluated. Therefore, exploring alternative metrics that capture resilience and adaptive capacity during crises is crucial.

[10] Armenia becomes vaccine tourism hot spot for Iranians (2021). [online] Available at: https://www.reuters.com/world/middle-east/armenia-becomes-vaccine-tourism-hot-spot-iranians-2021-07-19/ [Accessed 12.09.2023].

Table 3. **Top-10 countries in Medical Tourism Ranking and its death rate during a pandemic**

Country	MTI Overall Ranking	Medical tourism index	Death rate per 1 million infected	Death ranking
Canada	1	76.47	1,385	88
Singapore	2	76.43	332	159
Japan	3	74.23	602	134
Spain	4	72.93	2,562	42
United Kingdom	5	71.92	3,426	19
Dubai / Abu Dhabi	6/9	71.85/70.26	248	164
Costa Rica	7	71.73	1,819	68
Israel	8	70.78	1,344	91
India	10	69.80	376	152

Sources: Medicaltourism.com. (2022). *Medical Tourism Index 2020–2021*. [online] Available at: https://www.medicaltourism.com/mti/home [Accessed 04.09.2023]; and (Mathieu et al., 2020).

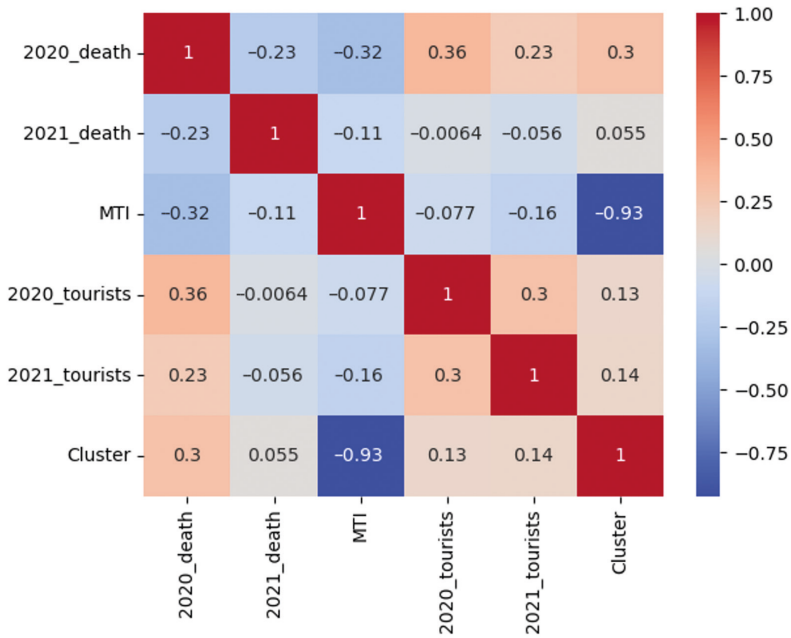

Fig. 9. Correlation matrix MTI, tourist flows and deaths during the pandemic

3.4. Psychological impact and changing preferences

The COVID-19 pandemic has not only disrupted the global health landscape but also significantly altered the psychological contours and preferences within the medical tourism sector. Travel behaviour has seen a notable change, with potential tourists now prioritising safety and hygiene over traditional destination choices (Rokni, 2021).

During the pandemic, the perceived risk associated with travel resulted in a decline in conventional medical tourism, while simultaneously, "vaccine tourism" surged as individuals sought access to COVID-19 vaccinations, particularly in countries where vaccine availability was scarce (Orden-Mejía et al., 2022). This emergent form of tourism underscores the complex interplay between health security and mobility in a pandemic-ridden world.

Post-pandemic tourist preferences have leaned towards urban and cultural tourism, often combined with medical checks, reflecting a new pattern of travel that merges health with leisure and family time (Park et al., 2021). The industry is expected to witness rhythmic growth, with periods of acceleration depending on global health situations and travel policies. As the sector navigates through the pandemic's consequences, there's a growing realisation that restoring traditional international tourism trends may require significant time and effort. However, domestic medical tourism has gained momentum, potentially offsetting some losses from the international downturn.

Looking forward, the psychological impact of the pandemic is anticipated to continue influencing travel behaviours. The medical tourism industry must adapt to these changing preferences, focusing on psychological reassurance and establishing trust to regain its pre-pandemic levels of activity.

3.5. Socio-economic consequences

The socio-economic impacts of the COVID-19 pandemic on medical tourism have been profound and far-reaching. The sudden halt in global mobility struck at the very heart of an industry that relies on cross-border travel, leading to an unparalleled economic crisis within the sector. The halt in medical tourism due to closed borders and the subsequent decline in revenues have placed immense strain on economies that previously thrived in this niche (Mosazadeh et al., 2022).

The pandemic has incurred significant social impacts as well. Many entities dependent on the medical tourism industry have faced uncertainty, with the loss of jobs and income affecting communities and individuals who serve this sector. The shock has been systemic, with ripple effects felt across the service and supply chains associated with medical tourism, from accommodation and transport providers to healthcare and retail services.

Despite these challenges, the industry is beginning to pivot towards recovery. New policies are being developed to bolster the sector, focusing on sustainable growth and the integration of health safety measures to reassure medical tourists. Such initiatives aim to revive the market while ensuring that public health remains a priority[11].

As we emerge from the pandemic, it's evident that medical tourism will not return to its previous state. Instead, it will evolve into a new form, likely more digitally integrated and with enhanced health security protocols.

3.6. Technological integration and innovation

The COVID-19 pandemic accelerated a significant technological shift within the tourism sector. As traditional medical travel was curtailed, a new era marked by digital healthcare solutions emerged to sustain and reshape the industry. Utilising video tech-

[11] OECD (2020). Tourism Policy Responses to the coronavirus (COVID-19). [online] Available at: https://www.oecd.org/coronavirus/policy-responses/tourism-policy-responses-to-the-coronavirus-covid-19-6466aa20/ [Accessed 06.08.2023].

nology, healthcare providers began to offer virtual consultations, allowing for continuous patient care without the necessity of travel and maintaining treatment progress from afar[12]. Telepsychiatry, a part of this digital transformation, has played a crucial role in ensuring continuous access to mental health care when traditional face-to-face interactions were restricted (Di Carlo et al., 2021; Balcombe and De Leo, 2021; Connolly et al., 2021). This shift not only addressed immediate needs during travel restrictions but also laid the groundwork for a more resilient medical tourism ecosystem capable of withstanding future global health crises. Technological advancements and the evolution of telemedicine are projected to accelerate the growth of global medical tourism, with an expected Compound Annual Growth Rate (CAGR) of 12.7 % by 2033[13].

In the post-pandemic landscape, we witness the growth of health tech innovations such as virtual reality for pre-treatment walkthroughs and AI-driven platforms for personalised treatment options or reshaping medical tourism through AI and robotics (Hassan and Bellos, 2022). Additionally, blockchain technology could be employed to issue digital certificates for polymerase chain reaction (PCR) test outcomes and other health-related documentation. PCR test certificates, which are mandatory for travellers during international departures and arrivals, could benefit from blockchain's ability to prevent fraud and ensure authenticity. This technology also empowers tourists with complete control over their records, allowing them to selectively grant access to necessary authorities.

Mobile technology, including health apps and telecommunication tools, has been instrumental in expanding the reach of health services. These technologies allow for real-time monitoring of patients' health, providing tools for the self-management of different non-critical conditions. During the COVID-19 pandemic, mobile health technologies have been critical in overcoming the barriers of physical distancing. By bridging the physical gap, they have ensured that individuals continue to receive the health support they need, thereby playing a significant role in the public health response to the pandemic. The widespread adoption of cutting-edge technologies in healthcare is unlocking new opportunities for improving the quality and accessibility of medical services, which, in turn, is driving enhancements in patient experiences and the development of medical tourism. However, at the same time, they also pose certain threats to the medical tourism industry, as they disrupt traditional business models.

This is why we are witnessing the emergence of a new trend towards hybrid medical tourism experiences[14]. Patients are now looking for a blend of in-person and virtual care tailored to their specific needs and circumstances. In response, companies operating in the sector must provide flexibility and adaptability in their services to meet new expectations. The hybrid model provides continuity and consistency of medical care, enabling patients to receive high-quality care across all stages, including pre-procedure preparation, the clinical intervention itself, and post-care follow-up. We propose the term "phygital tourism" for this hybrid model, where "phygital" refers to the combination of digital and

[12] Digital Healthcare and Post-COVID-19 Medical Travel. [online] Available at: https://www.magazine.medicaltourism.com/article/digital-healthcare-and-post-covid-19-medical-travel [Accessed 11.11.2023].

[13] Apcoworldwide.com (2022). Post-pandemic Medical Travel and Tourism — Will It Return to What It Once Was? [online] Available at: https://apcoworldwide.com/blog/post-pandemic-medical-travel-and-tourism-will-it-return-to-what-it-once-was/ [Accessed 02.12.2023].

[14] LinkedIn. Hybrid Medical Tourism Experience is the Future Post-COVID. [online] Available at: https://www.linkedin.com/pulse/hybrid-medical-tourism-experience-future-post-covid-pramod-goel [Accessed 03.11.2023].

physical systems that creates a synergistic effect. The trend of digitalisation should also lead to the emergence of phygital medical tourism.

The pandemic has undeniably pressed the fast-forward button on the adoption of technology in medical tourism, and the trajectory points towards an increasingly digital future. As the industry continues to adapt, technology will likely play an even more crucial role, from initial consultation to post-treatment follow-up, shaping a new paradigm for medical travel in the years to come.

4. Discussion

The analysis of the relationship between the overall tourist flow and medical tourists reveals a notable disparity in their respective trends. While a significant decline in overall tourist flow during the pandemic would intuitively suggest a similar decrease in medical tourism, the data paints a more nuanced picture. Our findings indicate that in three out of the four countries studied, the proportional decline in medical tourists was less pronounced compared to the overall decline in tourism, with India being the only exception. This phenomenon may be ascribed to several factors, including: (a) many countries deemed medical treatment a legitimate reason for entry during the pandemic, even amidst strict travel restrictions; (b) cancelling medical travel often involves greater financial and logistical complexities compared to cancelling leisure trips; and (c) medical tourists are often driven by urgent needs and essential treatments, making them less susceptible to fluctuations in travel restrictions and global events compared to leisure travellers.

The findings of this study reveal the complex relationship between the robustness of medical tourism sectors and their efficacy in managing the COVID-19 pandemic. While there is no direct correlation between a country's Medical Tourism Index and its death rankings during the pandemic, the resilience of healthcare infrastructures in certain nations, particularly the UAE and Singapore, has been remarkable. These countries effectively leveraged their established medical tourism infrastructure to mitigate COVID-19's global health risks, demonstrating successful alignment of healthcare resources with emergent crisis management needs.

The politicisation of coronavirus vaccines has introduced a complex dynamic to global health governance (Goroshko et al., 2021). As nations grapple with the balance of competitive profit-seeking and the equitable distribution of health resources, the industry has witnessed the rise of vaccine tourism. This phenomenon has both supported and challenged existing medical tourism infrastructures, indicating the need for a strategic approach to manage such emergent trends ethically. There are also certain doubts regarding the accuracy of the reported COVID-19 mortality data among individual countries. Statistical data provided by national agencies can become the subject of political speculation. Some countries have introduced "COVID-passports" as a contentious yet motivating factor for travel among vaccine tourists. This initiative has raised important ethical questions about healthcare accessibility and the global distribution of vaccines. It also prompts a re-evaluation of how medical tourism can evolve to accommodate and address such ethical considerations while ensuring the safety and well-being of medical tourists.

The medical tourism industry's response to the pandemic has also underlined the critical role of digital health technologies. The accelerated adoption of telemedicine, for instance, reflects a significant shift towards digital healthcare solutions, which has reshaped patient

engagement and care delivery within the medical tourism sector. This shift towards digital platforms has the potential to redefine the parameters of medical tourism, making it more accessible and less dependent on physical travel, however, it also raises questions regarding the preservation of personal data and patients' medical confidentiality.

5. Conclusions

The COVID-19 pandemic has triggered an unprecedented crisis in worldwide tourism, particularly impacting medical tourism and significantly altering the industry's landscape. The closure of borders and the reduction in tourist transportation led to a drastic decline in international tourist arrivals, severely impacting tourism-reliant economies. Beyond immediate economic losses, the pandemic's impact extends to psychological and behavioural changes among medical tourists, reshaping their priorities and expectations.

The emergence of vaccine tourism and the increased adoption of telemedicine are testaments to the sector's resilience and adaptability. Vaccine tourism, driven by varying global vaccine availabilities and policies, has emerged as a significant but controversial aspect of medical travel during the pandemic. Meanwhile, the acceleration of telemedicine reflects a broader trend towards digital healthcare solutions, reshaping patient engagement and care delivery in the medical tourism industry.

The death rankings during the pandemic do not exhibit a direct correlation with the MTI, indicating that a country's proficiency in managing the pandemic is not necessarily linked to the robustness of its medical tourism sector. However, countries such as the UAE and Singapore have demonstrated how a resilient healthcare infrastructure can be effectively mobilised to mitigate the global risks posed by the pandemic. These nations capitalised on their established medical tourism frameworks to support and sustain health crisis responses. Such insights are instrumental for policymakers and stakeholders, as they underscore the importance of a strong healthcare system — not just for medical tourism but also for pandemic preparedness and response. Understanding the dual challenges faced by prominent medical tourism destinations during COVID-19 is crucial for developing strategies that bolster health crisis management while fostering the continued growth of the medical tourism industry. Future strategies should focus not just on economic recovery but also on building more ethical, sustainable, and patient-centred medical tourism ecosystems across the countries.

Embracing digital health technologies, ensuring equitable access to healthcare, and adapting to changing consumer behaviours are pivotal for the industry's resilience in a post-pandemic world. A distinct shift is emerging towards a "phygital" approach to medical tourism. Individuals are increasingly seeking a personalised mix of direct and remote healthcare services that align with their unique health requirements and situations.

Future research on this could explore the long-term sustainability of "phygital" medical tourism models that have emerged during the pandemic, as well as the effectiveness of international regulatory frameworks in standardising health and safety protocols in a post-pandemic era. Furthermore, examining the psychological impact of pandemic-era medical travel on patients, such as stress levels and satisfaction with remote consultations, could yield valuable insights into improving the medical tourism experience. Similarly, investigating the use of digital geospatial twins to simulate patient flows and optimise

resource allocation in medical tourism facilities could offer ground-breaking perspectives on how advanced technology can enhance patient experience and operational efficiency in this rapidly evolving sector.

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Received: December 26, 2023
Accepted: September 18, 2024

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Трансформация международного медицинского туризма под воздействием COVID-19*

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Для цитирования: Grudtsyn, N. A. (2024). Transformative impact of the COVID-19 pandemic on medical tourism. *Вестник Санкт-Петербургского университета. Науки о Земле*, 69 (4), 646–666. https://doi.org/10.21638/spbu07.2024.403

Исследование направлено на анализ воздействия пандемии COVID-19 на глобальный туризм в общем и на индустрию медицинского туризма в частности. Автор использует междисциплинарный подход и смешанные методы исследования. Количественный анализ проведен с использованием данных Всемирной туристской организации и Международного банка. Качественный анализ включает обзор литературных источников и примеры отдельных стран. Результаты расчетов демонстрируют значительный спад туристических потоков по странам в 2020 г., за которым последовала сложная разнонаправленная динамика в 2021 г. Проведенная кластеризация раскрывает различные тенденции в туристических потоках в разных странах и регионах, а также выступает в качестве основы для будущих исследований. Неоднородность динамики туристических потоков связана с индивидуальной адаптацией туристического сектора в различных странах к новому характеру транспортных связей и ландшафту сфер здравоохранения и услуг. В частности, появление вакцинного туризма определяется как отдельная ниша, отражающая не только меняющиеся приоритеты медицинских туристов, но и новую геополитическую тенденцию. Сопоставлено место стран по индексу медицинского туризма (MTI) и показатель смертности от COVID-19. Сделан вывод о том, что рейтинг MTI может являться маркетинговым инструментом, однако не отражает ситуацию в сфере здравоохранения в случае глобальных кризисных событий. Исследование рассматривает психологические и социально-экономические последствия пандемии для туризма, подчеркивая растущую важность психического здоровья в обеспечении благополучия человека. Раскрыто влияние цифровых технологий на туризм. Предложено использование концепции «фиджитал»-подхода применительно к гибридному медицинскому туризму.

Ключевые слова: общественное здоровье, туристические потоки, гибридный медицинский туризм, фиджитал-подход, поведение туристов, кластеризация, сравнительный анализ.

Статья поступила в редакцию 26 декабря 2023 г.
Статья рекомендована к печати 18 сентября 2024 г.

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* Исследование выполнено при поддержке гранта Российского научного фонда № 23-28-00279 «Траектории развития рынка российского медицинского туризма в условиях переформатирования мирового порядка».