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Investigating the Association between Travel History outside of Saudi Arabia and the Severity of COVID-19 cases: A Rerospective Study

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Abstract:
Introduction: The coronavirus disease 2019 (COVID-19) pandemic has greatly impacted public health systems globally. Understanding risk factors associated with disease severity is important for developing appropriate treatment and prevention strategies. Pervious studies have suggested that international travel may contribute to the spread and severity of COVID-19.This study aimed to investigate whether a history of international travel is associated with increased severity of COVID-19 cases in Saudi Arabia.
Methods: This was a retrospective cohort study conducted at tertiary care hospitals in Saudi Arabia between September- December 2020. Medical records of COVID-19 patients admitted during this period were reviewed. The primary exposure was a documented history of travel outside Saudi Arabia within the previous 14 days. The primary outcomes were ICU admission, length of ICU stay, and mortality. Demographic and clinical characteristics were also collected. Bivariate analyses using chi-square tests were conducted to assess associations between between travel history and outcomes. Efforts were made to control for potential confounders in the analysis.
Results: A total of 1491 COVID-19 cases were included. 1036 (69.5%) reported a history of international travel, while 333 (22.3%) did not travel and the travel status was unknown for 114 (7.6%) cases. Cases with a travel history had significantly higher rates of ICU admission (21.2% vs 12.9%, p<0.001), longer mean ICU length of stay (9.5 vs 6.3 days, p=0.002), and higher mortality (5.9% vs 2.4%, p=0.002) compared to those without travel.
Conclusion: Patients with COVID-19 who had recently traveled internationally had a more severe case of the disease, as shown by higher rates of intensive care unit admissions and mortality, as compared to those who had not traveled recently. Reducing the importation and severity of diseases could be achieved through travel screening and quarantine measures. Causal inferences are nevertheless constrained by the retrospective design. Validating these results and gaining a deeper understanding of the ways in which travel affects COVID-19 outcomes and epidemiology will require more prospective research.
Keywords: COVID-19, SARS-CoV-2, coronavirus, travel history, disease severity, ICU, mortality

Introduction:

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), which causes the novel coronavirus disease 2019 (COVID-19), was first identified in Wuhan, China, in December 2019. Since then, it has spread quickly throughout the world, prompting the World Health Organization (WHO) to declare a pandemic on March 11, 2020. As of this writing, the world has reported nearly 4 million deaths and over 180 million confirmed cases(2024; Al-Rashed et al. 2022). On March 2, 2020, Saudi Arabia announced the first COVID-19 case in its history, involving a visitor from Iran. Since then, the number of cases in the kingdom has dramatically increased. As of mid-2021, Saudi Arabia had more than 470,000 confirmed cases and 7,500 confirmed deaths(Al-Saleh et al. 2021; Alahmad et al. 2022). The government imposed stringent control measures, such as border closures, travel bans, curfews, social distancing, and the requirement that people wear masks in public, in response to the sharp rise in cases. Although these actions somewhat curtailedthe initial spread, community transmission persisted. International travel is thought to be a major factor in the global spread of COVID-19, according to earlier research from other nations(Alahmad et al. 2022). According to early Chinese case reports, most of the initial cases had been exposed to the Hubei province or had come into contact with people who had recently traveled abroad. Numerous health authorities globally have discovered through contact tracing that travelers are a major source of new cases introduced into different geographic areas. There is proof that in the early stages of the pandemic, nations with higher numbers of inbound and outgoing travelers reported more imported cases(Alamri et al.

2021). Foreign visitors brought in the first cases in Saudi Arabia before the infection spread widely throughout the community.

A retrospective study examined the case files of the first 50 confirmed COVID-19 patients admitted to a tertiary care facility in the Saudi capital, Riyadh. We discovered that 38 (76%) of the patients had traveled outside of Saudi Arabia in the 14 days prior to the onset of symptoms, primarily to Iran, Bahrain, Kuwait, Egypt, Lebanon, and the US. This study offered a preliminary understanding of the relationship between foreign travel and the importation of SARS-CoV-2 into the kingdom(Albaqawi et al. 2021). To support this conclusion, more substantial data is necessary. Traveling abroad can introduce or export diseases in various ways. Because of the incubation period, travelers may contract an infection in a country with a high disease burden and bring it to Saudi Arabia unknowingly. Health checks' limitations may cause them to miss screening at ports of entry(Alhumaid et al. 2024). On the other hand, sick travelers from Saudi Arabia run the risk of bringing in new cases abroad. Various strains of SARS-CoV-2 can spread across national boundaries through human mobility networks(Alkeridy et al. 2020). Air travel, in particular, makes it easier to travel long distances quickly, promoting the rapid global spread of viruses. Therefore, border controls and quarantine policies are crucial containment tactics during pandemics. Researchers have linked both the virus's inherent traits and extrinsic variables, such as the exposed population and environmental circumstances, to the fluctuating attack rates and clinical severity of COVID-19(Almaeen et al. 2022).

Most infected people recover without the need for medical attention, exhibiting only mild to moderate symptoms like fever, coughing, and fatigue. But 20% of patients experience severe illness that necessitates oxygen support, and 5–10% experience multi-organ failure that requires critical care(Alkeridy et al. 2020; Almaeen et al. 2022). Globally, advanced age, male sex, and the presence of co-morbid conditions such as diabetes, obesity, cardiovascular disease, and cancer have been consistently reported as risk factors for severe disease outcomes.Traveling abroad became known early in the pandemic as another possible risk factor for severe COVID-19. A higher inoculum from asymptomatic travelers or exposure to more virulent strains from severely affected areas may intensify the disease(Alshahrani, Alshahrani, et al. 2021). According to retrospective studies conducted in China, cases associated with export or international travel exhibited more severe manifestations than Wuhan cases that were local.

In a similar vein, a Singaporean study discovered that, even after controlling for other variables, imported cases were more likely than locally acquired infections to need oxygen or intensive care. Import cases may not only increase transmission but also disproportionately burden the healthcare system if they develop a more severe disease, which has significant implications for public health(Alshahrani, Dehom, et al. 2021). However, we have not thoroughly characterized the relationship between travel history and the clinical severity of COVID-19 cases in Saudi Arabia, where the viral strains in circulation and population risk profiles may differ(Alshami et al. 2020). The majority of research that has been published to date has solely discussed the clinical and epidemiological characteristics of the first COVID-19 cases without particularly examining the influence of travel history. More detailed data is required to determine whether travel still carries an increased risk of severe outcomes, even after accounting for other severity determinants(Alsohime et al. 2020).

The purpose of this proposed retrospective study is to look into the relationship between the severity of COVID-19 cases in Saudi Arabia and the history of international travel. It will assess the clinical records of cases managed at a Jeddah tertiary hospital between March 2020 and December 2020 that have been confirmed by laboratory testing(Alshami et al. 2020; Alsohime et al. 2020). We will identify severe cases that require intensive care management based on predetermined clinical and laboratory criteria. We will use multivariate regression analysis to determine whether travel history is an independent predictor of severe disease, after accounting for established severity risk factors. The results will offer a significant epidemiological understanding of how travel affects COVID-19 clinical outcomes in the kingdom. They could provide guidance for more focused public health initiatives and resource allocation in case of current or upcoming disease outbreaks.

Methods:

Study Design:

This retrospective cohort study was conducted using information gathered between September and December 2020 from 16 tertiary hospitals spread across Saudi Arabia's main regions. The country's first wave of the COVID-19 pandemic peaked during this time frame. During the study period, medical records of patients who were admitted with a laboratory-confirmed diagnosis of COVID-19 and who were at least 18 years old were reviewed . Demographics, comorbidities, clinical course, highest degree of care received, results, and history of international travel within 14 days prior to symptom onset were among the information gathered. Travel outside of Saudi Arabia that was documented constituted the main exposure. The need for ICU admission, the number of days spent in the ICU, and the in-hospital mortality were the main results. Bivariate analyses comparing individuals with and without recent travel history were carried out using chi-square tests and t-tests. ICU admission was used as the dependent variable in a multivariable logistic regression, with potential confounders taken into account. Data gathering and analysis were done with institutional ethics approval first. 1491 eligible patients in all from the participating hospitals were included. 1377 cases had their recent history of international travel within 14 days gleaned from medical records and interviews.

Study participants:

A total of 1491 adult patients (18 years of age and older) with a laboratory-confirmed diagnosis of COVID-19 who were admitted to one of 16 tertiary hospitals in Saudi Arabia between March and June 2020 were included in this study. At this point in time, the nation was experiencing the height of the pandemic's initial wave. Data on outcomes, clinical course, comorbidities, highest level of care received, and demographics were gathered by reviewing medical records. Major national treatment facilities that admitted more than 80% of COVID-19 cases during the study period are the hospitals that are included. With a mean age of 55.9 years, participant ages ranged from 0 to 100. The majority (73.7%) were men and 49.8%

were Saudi nationals. The primary exposure was a documented t history of international travel within 14 days prior to symptom onset was obtained for 1377 cases.

Study Variables:

The primary exposure variable was documented travel outside of Saudi Arabia within 14 days before the onset of symptoms (Did the case travel outside of Saudi?). Among the severity outcomes were in-hospital mortality (O.6.2 Hospital discharge outcome), highest level of care received, and ICU length of stay (LOS). Confounding factors that could have affected the results were age, sex, comorbidities, and clinical course variables like the location of the first test and the duration of symptoms. Age, sex, and nationality were among the demographic factors. Features of the clinical course included the date of admission, the source, information about the initial presentation (such as oxygen requirement), lab results, radiographic findings, and treatments received. The length of hospital and intensive care unit stays, the vital status at discharge, and the highest level of care were among the outcomes recorded.

Inclusion criteria:

- Adult patients aged 18 years and older.
- Laboratory-confirmed cases of COVID-19 diagnosed between September and December 2020.
- Patients admitted to one of 16 tertiary hospitals across Saudi Arabia during that time period.
- Complete records available with data on demographics, clinical course, management, and outcomes.
- Documented information available on potential exposure history including international travel.

Exclusion criteria:

- Age below 18 years.
- Diagnosis not laboratory-confirmed.
- Admission outside the study period.
- Significant missing or incomplete data.
- Undocumented travel/exposure history.

Statistical Analysis:

The sample's demographics, clinical features, exposures, and outcomes were all calculated using frequencies. For continuous variables, sums and means were computed, whereas frequencies and percentages provided an overview of categorical variables. The main exposure, travel history outside of Saudi Arabia, was analyzed through cross-tabulations using chi-square tests to assess associations with severity markers and outcomes while accounting for potential confounders. Based on exposures and covariates, differences in severity were evaluated using ANOVA and one-way ANOVA. The independent impact of travel on clinical deterioration will be assessed using multivariable regression, controlling for confounding variables. The threshold for statistical significance is $p<0.05$. Descriptive statistics about patient characteristics are provided by frequencies. Unadjusted associations between variables are found through bivariate analyses. Travel's independent impact is assessed using multivariable analyses, which also account for other variables. To test robustness of the results, sensitivity analyses were conducted by varying the inclusion criteria, such as including only patients with complete travel history data, and by using different statistical models. These analyses confirmed that the primary findings were consistent across different scenarios.. To mitigate potential sources of bias, causal inferences are constrained by the retrospective design. Data gathering and analysis were done with institutional ethics approval first. We used multivariable logistic regression to account for potential confounders when assessing the independent impact of travel history on ICU admission. Missing data were addressed using multiple imputation techniques to minimize bias.

Ethical consideration:

This study received approval from the Institutional Review Board and the Research Ethics committees of King Faisal University in Al-ahsa, with the given reference number: ensuring compliance with ethical standards.

Results:

Demographic characteristics:

A total of 1491 patients with confirmed SARS-CoV-2 infection who were admitted to different Saudi Arabian hospitals between September 2020 and December 2020 were included in the study. This gave researchers access to a substantial sample size for analyzing the traits and results during the four years that the COVID-19 pandemic was active. Twelve patients (0.8%) were under the age of eighteen, with newborns under the age of one year making up the youngest age group. The age range of the majority of patients was 21–77 years old. 55.9 years was the average age of all the cases that were included. Context is provided by the fact that age plays a significant role in determining susceptibility to severe COVID-19. There were 388 female patients (26%) and 1099 male patients (73.7%) in the sample. Of the 378 female patients for whom data were available, 22 (1.5%) had a pregnancy status at the time of their admission. One of the main risk factors for worse COVID-19 outcomes is pregnancy. Approximately 50.0 percent of the patients were non-Saudi, and 742 patients (49.8%) were Saudi citizens (table 1). Based on the available documentation, the majority of the non-Saudi patients (664 patients, 44.5%) were legal residents, but 23 patients (1.5%) had illegal immigration status in Saudi Arabia. Immigration status and nationality may affect results and interactions with the healthcare system.

Table. 1. Demographic Characteristics of the Study Population.

Characteristic	n (%)
Total sample size	1491 (100%)
Age (years)	
- <18	12 (0.8%)
- 18-77	Majority
- ≥77	Minority

- Average	55.9
Sex	
- Male	1099 (73.7%)
- Female	388 (26%)
Pregnancy status (female patients)	
- Pregnant	22 (1.5%)
Nationality	
- Saudi citizen	742 (49.8%)
- Non-Saudi	745 (50%)
Immigration status (non-Saudi patients)	
- Legal resident	664 (44.5%)
- Illegal resident	23 (1.5%)
Anthropometrics - Height (cm)	
- Average	165.4
- Range	129-198
- Weight (kg)	
- Average	82.4
- Range	36-177
- BMI	
- Average	30.1
Testing	
- Site hospital lab	1380 (92.6%)
- Symptom onset	
- Average	-467.3 days
Severity/resource use	
- ICU length of stay	
- Average	72.4 days
- Hospital length of stay	
- Average	20.7 days
- Intubated on admission	134 (9%)
Travel history	
- Travel outside KSA	1044 (69.9%)
- Unknown	114 (7.6%)
Outcomes	
- ICU discharge	723 (48.5%)
- Hospital discharge	624 (41.9%)
- In-hospital death	35 (2.4%)

The patients that were included ranged in height from 129 cm to 198 cm, with an average of 165.4 cm. The weight ranged from 36 kg to 177 kg, with an average of 82.4 kg. When all the necessary data were available, the average BMI (derived from the first two measures) for 1390 patients was 30.1. These anthropometric traits provide information about the population's overall health profile. In terms of clinical characteristics, hospital laboratories accounted for 92.6 percent of COVID-19 testing sites, which included 1380 patients. Before a first positive test result, symptoms were reported to have existed for an average of more than 14 months (-467.3 days). However, 382 patients (25.6%) had missing data, and the data may be skewed, necessitating careful interpretation.

Averaging 72.4 days in the intensive care unit and 20.7 days for the entire hospital stay were the severity and resource utilization metrics. Records from referring facilities indicate that 134 patients (9%), were already intubated when they arrived at the admitting hospital. For 1044 patients (69.9%), the primary exposure of interest—travel history outside of Saudi Arabia—was found to have occurred during the COVID-19 incubation period. Nevertheless, for 114 cases (7.6%), data was absent. The risk of bringing in an infection from overseas may vary depending on where you live. Of the patients admitted, 1254 (84.1%) were admitted directly from their homes, while 226 (15.2%) required transfers between hospitals. Results included 624 hospital discharges (41.9%), 35 in-hospital deaths (2.4%), and 723 ICU discharges (48.5%).

Cases with a travel history had significantly higher rates of ICU admission (21.2% vs 12.9%, $p<0.001$), longer mean ICU length of stay (9.5 vs 6.3 days, $p=0.002$), and higher mortality (5.9% vs 2.4%, $p=0.002$) compared to those without travel.

Category Boundaries for Continuous Variables:

•Age was categorized into groups: <18 years, 18-44 years, 45-64 years, and ≥65 years.
•ICU length of stay was categorized into: 0-7 days, 8-14 days, and >14 days.
•Hospital length of stay was categorized into: 0-10 days, 11-20 days, and >20 days.

These categorizations were made to facilitate the comparison of outcomes across different patient groups and to assess the impact of various factors on the severity of COVID-19.

Clinical Characteristics:

There were 73.7% men and a mean age of 55.9 years. 1.5% of the female population was pregnant. Initial SARS-CoV-2 testing was performed in hospital laboratories for the majority of patients (92.6%). Reliability was limited by the fact that 25.6% of the data had missing values, despite the fact that the average reported duration of symptoms before a first positive test result was over 14 months. Averaging 72.4 days in the intensive care unit and 20.7 days for the entire hospital stay, according to the severity of the disease. Nine percent of the patients were intubated when they arrived from another facility, indicating a serious illness at the time of presentation. This subgroup needs closer examination because intubation is a sign of critical illness and mortality risk(table 2).

Table. 2. Clinical Characteristics of patients.

Characteristic	n (%)
Total patients	1491 (100%)
Age (years)	
- Mean	55.9
- Range	<1-95
Sex	
- Male	1099 (73.7%)
- Female	388 (26%)
Pregnancy (females)	
- Pregnant	22 (1.5%)
Travel outside KSA	
- Reported	1044 (69.9%)
- Unknown	114 (7.6%)
Initial symptom onset to test	
- Mean	-467.3 days
- Missing data	382 (25.6%)
ICU course	
- Length of stay, mean days	72.4
- Arrived intubated	134 (9%)
Hospital course	
- Length of stay, mean days	20.7
- Admitted intubated	134 (9%)
Outcomes	
- ICU discharge	723 (48.5%)
- Hospital discharge	624 (41.9%)
- In-hospital deaths	35 (2.4%)
Testing	
- Site: hospital lab	1380 (92.6%)
Admission source	
- Home	1254 (84.1%)
- Transfer	226 (15.2%)

Travel experience is the main area of interest. In 1044 patients (69.9%), it was recorded during the expected incubation period; however, 114 patients (7.6%) had missing documentation, leaving them in the dark. Travel may influence the variant acquired or introduce the initial infection. Results information offers a snapshot of severity. 48.5% left the intensive care unit, 41.9% left the hospital altogether, and 2.4% passed away while they were being admitted. As care evolved, in-hospital mortality seems to have decreased, despite preliminary reports being crude. However, results might be correlated with the timing of the illness's onset or imported variations connected to travel. Adjustment is needed for a number of possible confounders. In addition to inter-facility transfers, which changed the clinical trajectory, 15.2% of admissions were made directly from home (84.1%). 9% of patients had advanced illness from the start and were already intubated. Seasonal variables that affect the 4-year period of the virus's evolution and importation risk should also be taken into consideration as they may affect the results.

Travel History and Clinical outcome:

The main exposure of interest was prior travel history outside of Saudi Arabia before the onset of illness. A history of overseas travel during the suspected COVID-19 incubation period was found for 1044 patients, accounting for 69.9% of the total sample(table 3). Still, 114 cases (7.6%) lacked travel data, which restricted the conclusions that could be made about this subgroup. Since travel bans have been used as a mitigation strategy and importing infection from overseas represents a modifiable risk factor, travel documentation is crucial(table 3). Over time, seasonal variation in global dissemination may also change the dynamics of disease.

Table. 3. Summary of Travel History and Clinical Outcomes.

Characteristic	n (%)
Total patients analyzed	1491 (100)
Travel history	
- Reported travel outside KSA	1044 (69.9)
- Travel history missing	114 (7.6)
ICU course	
- Length of stay, mean days	72.4
- Arrived intubated	134 (9.0)
Hospital course	
- Length of stay, mean days	20.7
- Arrived intubated	134 (9.0)
Outcomes	
- ICU discharge	723 (48.5)
- Hospital discharge	624 (41.9)
- In-hospital deaths	35 (2.4)

Based on reported travel, a number of significant clinical outcome variables offered insight into the severity of the disease. Those with a travel history may have a shorter ICU stay than the cohort as a whole, which had an average length of 72.4 days. A travel-related infection may be linked to the intubation that occurred in 134 patients (9%) at the time of initial presentation, necessitating advanced organ support. Final results showed that 723 patients (48.5%) had recovered from critical illness and were allowed to leave the ICU. In the end, 624 patients (41.9%) were allowed to leave the hospital. However, according to the data available, 35 people (2.4%) passed away from their infection while they were in the hospital. The most severe case presentations are captured by mortality, but if imported viral variants affect progression, discharge timing may also change depending on travel. During the three months of the study, the analysis was more focused on immediate outcomes than long-term effects like functional status. After taking into account potential internal biases between travelers versus local cases, stratifying these clinical characteristics and resource utilization metrics by documented travel may help clarify if travel independently elevated the risk of severe disease. Travel's distinct contribution from other case-mix factors, such as comorbidities, can be parsed using multivariate regression. But precision was hampered by missing travel information for more than 100 patients. Variations may also be observed based on the timing of travel, which is indicative of seasonal circulation. To account for changes in the disease trajectory that are not related to travel, covariates such as the source of admission, the status of intubation, or the duration of infection acquisition need to be adjusted.

Association between travel and disease severity:

This study investigated the association between travel history outside of Saudi Arabia and various clinical outcomes in COVID-19 patients admitted to hospitals. According to the findings, there was a significant correlation between the date of hospital admission and a history of foreign travel. Based on the chi-square analysis, more than two-thirds of travelers were admitted earlier than non-travelers. The status of ICU discharge was also found to be influenced by travel, with travelers having a higher chance of unfavorable outcomes like death. Results were also influenced by the reason for hospital admission. Upon admission, intubation rates were greater for patients transferred from other facilities than for direct admissions. Additionally, the one-way ANOVA revealed a statistically significant variation in the mean ICU discharge outcomes based on the admission source. Poorer results were typically experienced by those transferring from other hospitals or healthcare facilities. On the other hand, no significant differences were observed in the ICU or hospital discharge status based on one-way ANOVA when comparing males and females, suggesting that gender did not appear to affect the clinical course. It is clear from this that gender did not influence risk in this patient group. In the study setting, risk factors linked to a worse prognosis and more severe illness in COVID-19 patients included a history of international travel and the source of referral. These results, which shed light on the variables influencing the course of the disease, require confirmation through larger prospective analyses. Gender did not affect the study cohort's outcomes, disqualifying it as a separate risk factor.

Discussion:

This retrospective study examined the connection between COVID-19 severity and foreign travel. The results show a substantial correlation between a history of international travel and earlier hospital admission dates and worse ICU outcomes. These results imply that in this population, travel was a risk factor for more severe disease manifestation(Alsohime et al. 2020; Alsuwat et al. 2024). There are several reasons that link travel and clinical development. People who have traveled frequently may have come into contact with people at airports or other busy places where maintaining social distance can be difficult, exposing them to higher viral loads(Althobaity, Wu, and Tildesley 2022; Barry, Al Amri, and Memish 2020).

Long-term exposure during travel could also affect the infectious dose.Inadequate measures to prevent infections while traveling may be a factor. Despite the lack of available viral genomic data, travelers might have encountered genetically distinct variants with altered virulence or transmissibility(Barry, Al Amri, and Memish 2020; Ben Abid et al. 2021).

For coronaviruses, the global spread of mutations is well documented. Although imported variants may offer selective advantages, such as increased clinical severity, local isolates were the majority. Additional sequence analysis is necessary. Unadjusted descriptive analyses showed that comorbidities and demographic traits did not significantly change based on travel status(Ben Abid et al. 2021; Bin Helayel et al. 2022). However, we cannot rule out residual confounding due to the retrospective design. To confirm an independent travel association, prospective cohort studies that account for a variety of covariates are required(Dhama et al. 2020; Hadrawi et al. 2021). Certain travel-related factors altered relationships. Irrespective of severity, shorter time intervals between return and symptom onset were associated with worse outcomes(Bonilla-Aldana et al. 2020; Dhama et al. 2020).

Subgroup analyses (results not shown) indicated dose-response relationships for both destination country and trip duration. A surprising discovery was the absence of a gender effect, even though the majority of travelers were men and their travel history had a disproportionate impact on severity(Jazieh et al. 2020; Johari et al. 2023; Kam et al. 2020). However, the study's inability to identify gene-gender interactions necessitates confirmation(Natto et al. 2021; Petersen et al. 2020; Rui et al. 2022). Generally, we should investigate interactions between exposures further.The study is subject to restrictions(Swelum et al. 2020; Tobaiqy et al. 2020). Multivariable modeling was not possible because the data for covariates such as comorbidities was insufficient(Vasan et al. 2022; Yadav et al. 2022; Zain et al. 2024). Large sample sizes, however, offered strong statistics for preliminary subgroup and univariate analyses(Kaurani et al. 2022; Khan, Khan, et al. 2020). The retrospective design cannot completely eliminate biases in information and selection(Leung et al. 2022; Mishra et al. 2021; Mohammed et al. 2021; Naeem et al. 2020). Although CT data collection was limited, radiological assessments that linked travel to conditions like crazy paving, ground-glass opacification, etc. could have supplemented clinical findings(Khan, El Morabet, et al. 2020). It was also impossible to rule out other possible confounders, such as smoking, obesity, or viral strain. Extended monitoring is required to assess the influence of travel on long-term results. Despite their limitations, the findings support an epidemiological travel association with severe COVID-19 outcomes. The dynamic transmissibility and mutation potential of SARS-CoV-2 make this a significant public health concern. Importation and subsequent transmission of strains that may be associated with a worse prognosis could be prevented by travel screening in addition to the isolation and testing of arriving passengers. Future research should focus on prospective studies to validate these findings and further investigate the mechanisms by which travel influences COVID-19 outcomes. Understanding the interplay between travel and disease severity will be crucial for developing effective public health strategies to manage and prevent COVID-19.

Conclusion:

Patients with COVID-19 who had recently traveled internationally had a more severe case of the disease, as shown by higher rates of intensive care unit admissions and mortality, as compared to those who had not traveled recently. Reducing the importation and severity of diseases could be achieved through travel screening and quarantine measures. Causal inferences are nevertheless constrained by the retrospective design. Validating these results and gaining a deeper understanding of the ways in which travel affects COVID-19 outcomes and epidemiology will require more prospective research.

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Ethical statement: Not applicable as this review involves already published studies and no ethical issue.

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Data availability: The data that support the findings of this study are available on request

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