



# SCIENTIFIC RESEARCH MONITORING ON COVID-19

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# SCIENTIFIC RESEARCH MONITORING ON COVID-19

## (Issue 442)

Abu Dhabi Public Health Center (ADPHC) is gathering the latest scientific research updates and trends on coronavirus disease (COVID-19) in a monthly report. The report provides summaries on breakthrough or updated research on COVID-19 to allow health care professionals and public health professionals get easy and fast access to information.

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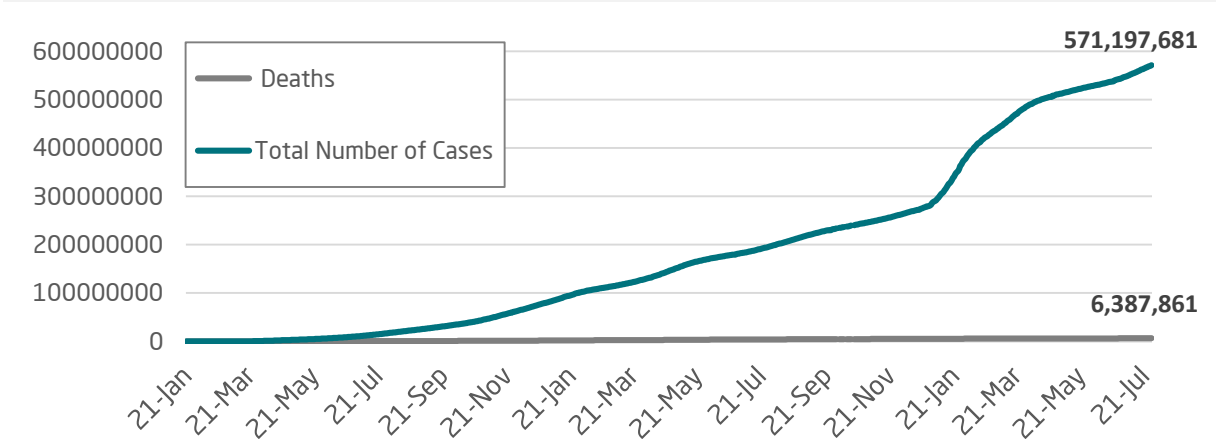
Coinfection with SARS-CoV-2 and Influenza A Virus Increases Disease Severity and Impairs Neutralizing Antibody and CD4+ T Cell Responses

Influenza co-infection associated with severity and mortality in COVID-19 patients

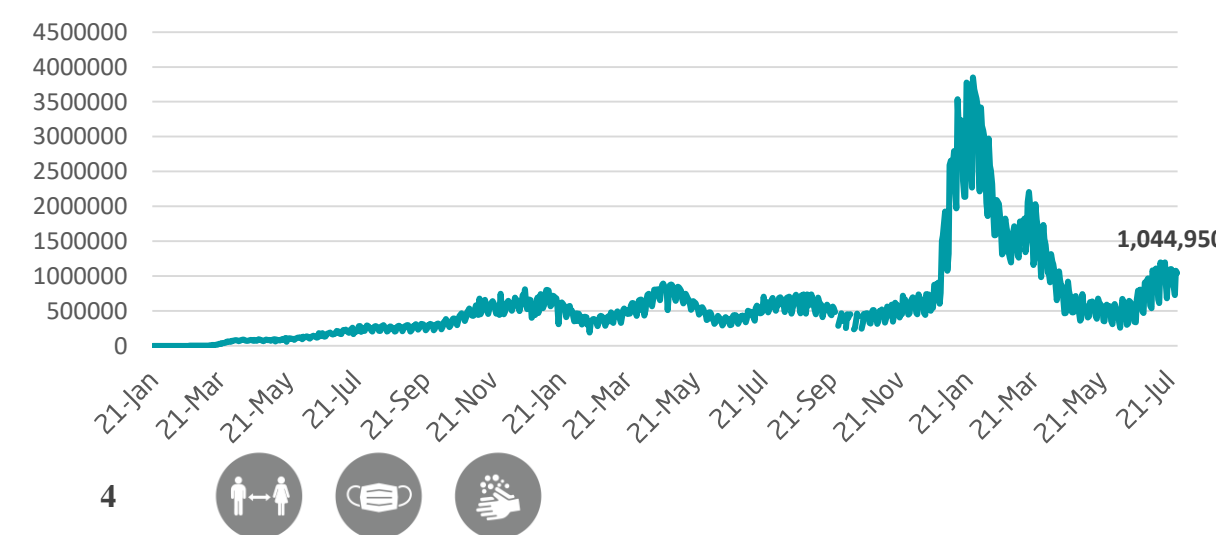
SARS-CoV-2 and Influenza Virus Co-Infection Cases Identified through ILI/SARI Sentinel Surveillance: A Pan-India Report



**Figure 1: Total Number of Infected, Recovered, and Death Cases**

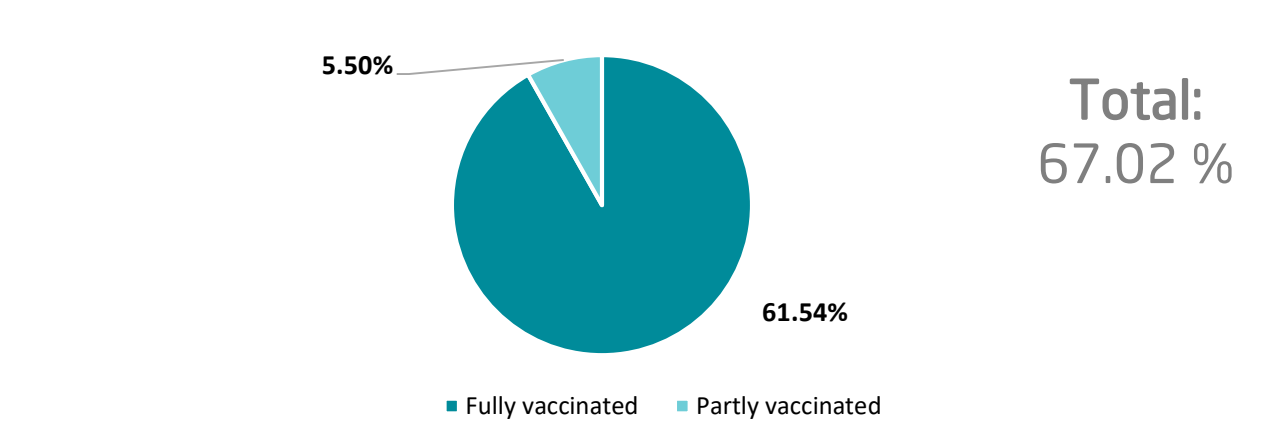


**Figure 2: Daily New Infected COVID-19 Cases**



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**Figure 3: % of people vaccinated fully & partly against COVID-19**



**Figure 4: Global Daily New Deaths Due to COVID-19**

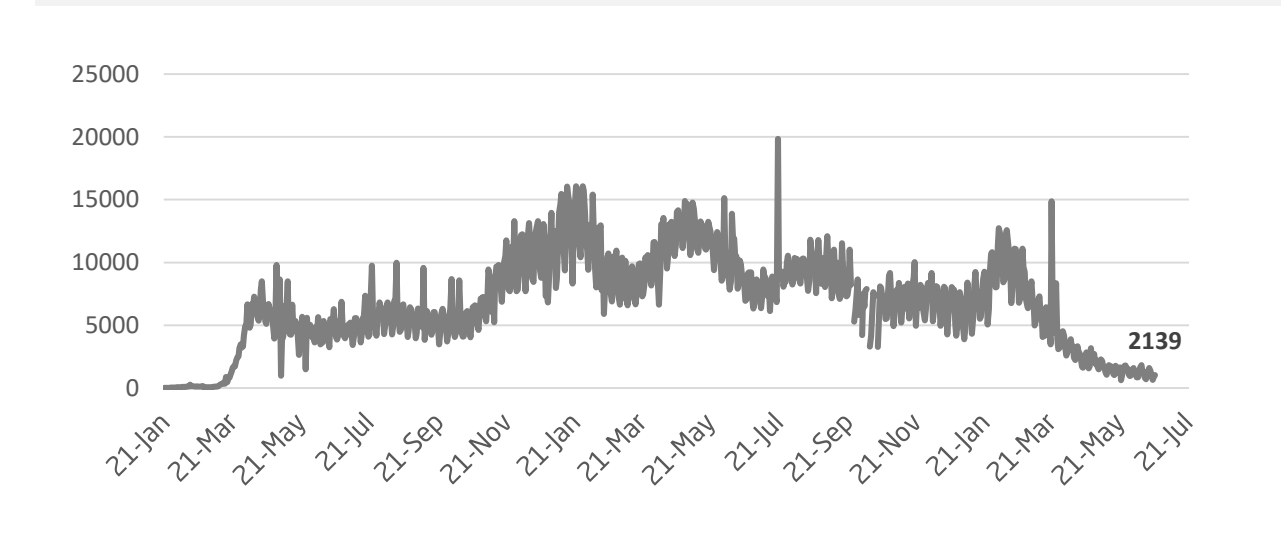


Figure 5: Top 10 Countries in the Total Number of Cases Due to COVID-19

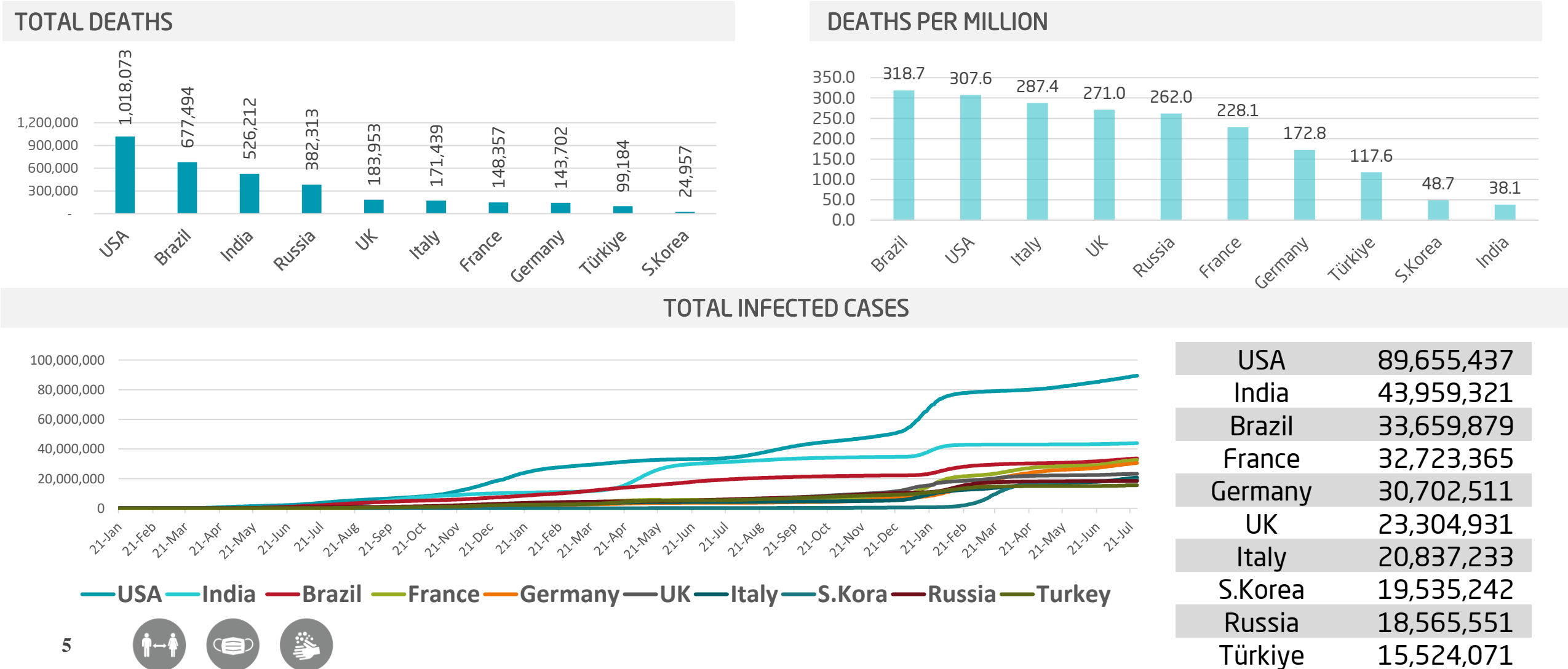




Figure 8: COVID-19 Status in the UAE (Federal Competitiveness and Statistics Authority Dashboard). (Last update on April 2022)

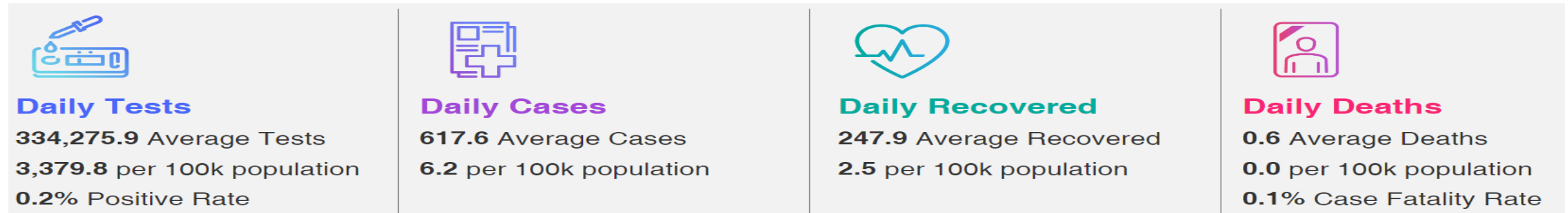
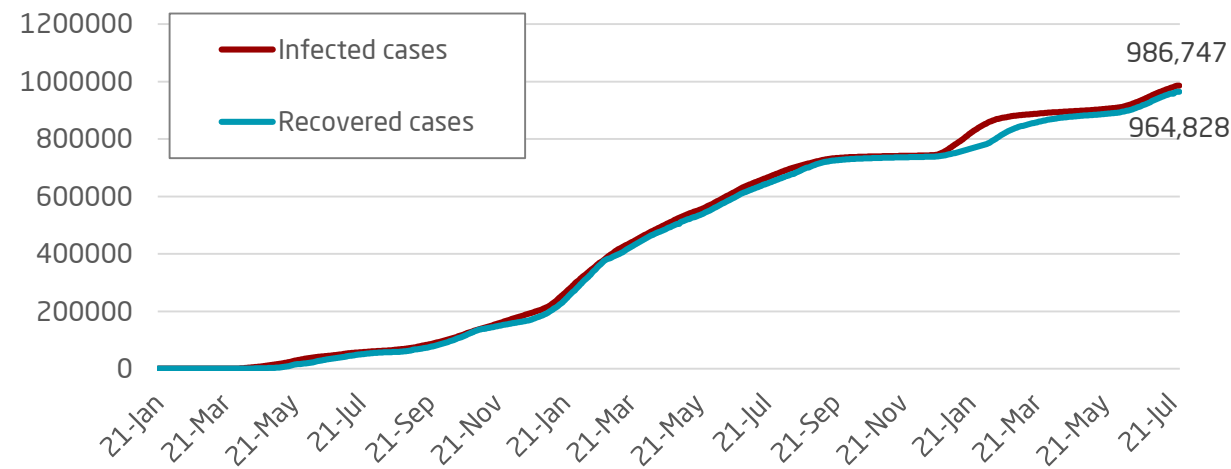


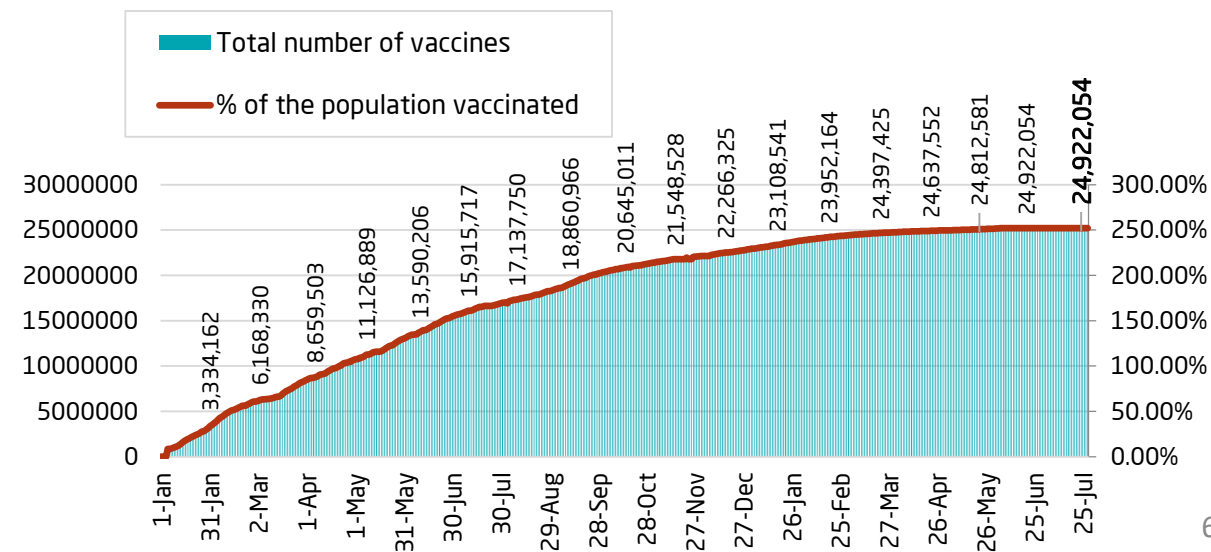
Figure 6A: TOTAL Number Of Infected And Recovered Cases Due To Covid-19 Reported By The UAE



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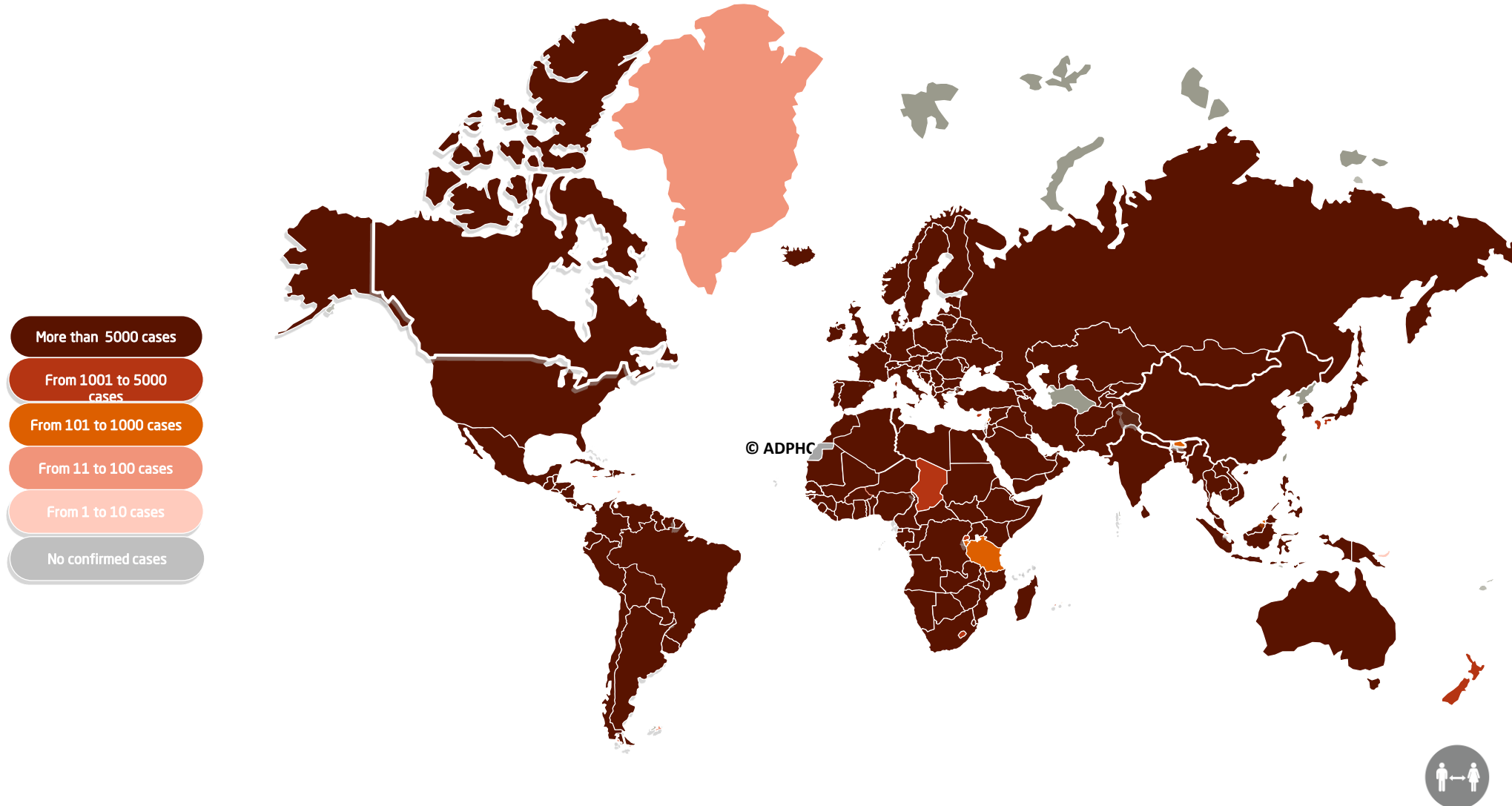
Figure 6 B: TOTAL NUMBER and Percentage of UAE population Vaccinated



6



Figure 7A : Global Distribution of COVID-19 Cases



### Figure 7B: Bar Chart Illustrates the Global Distribution of COVID19 Cases

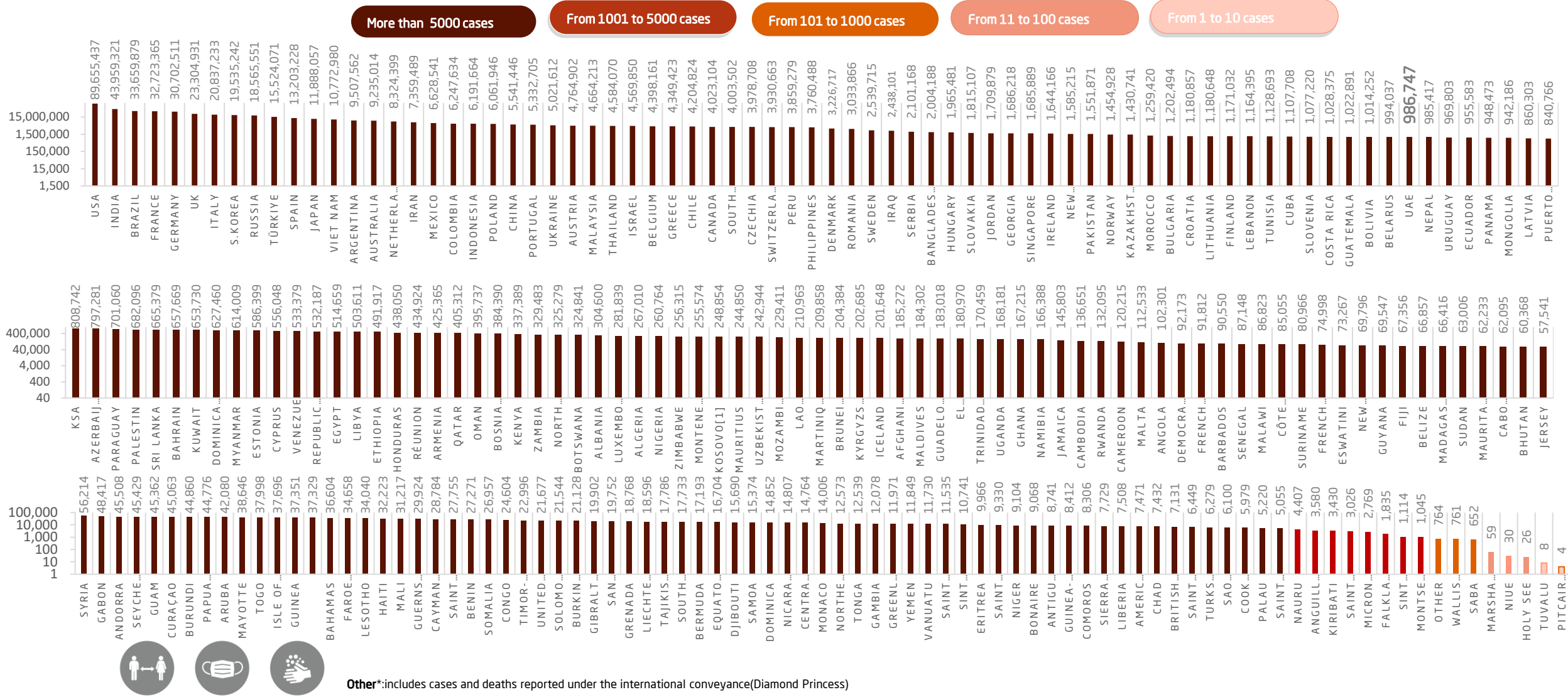


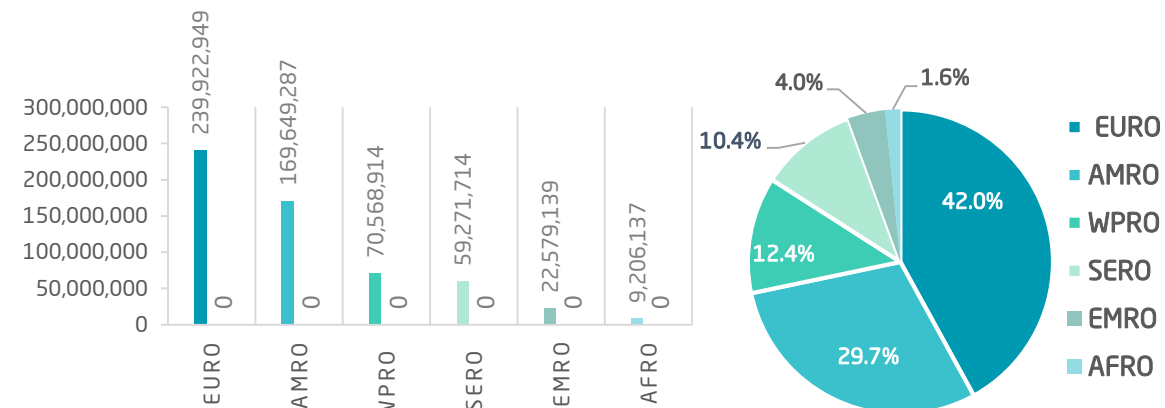




Figure 8: Global Distribution of COVID-19 Cases per Region



## INFECTED



## DEATHS

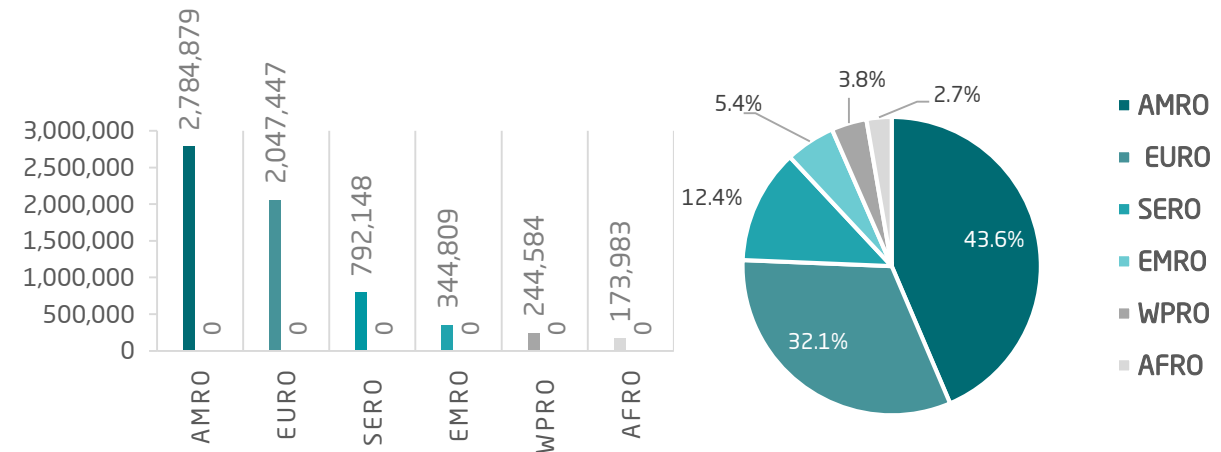
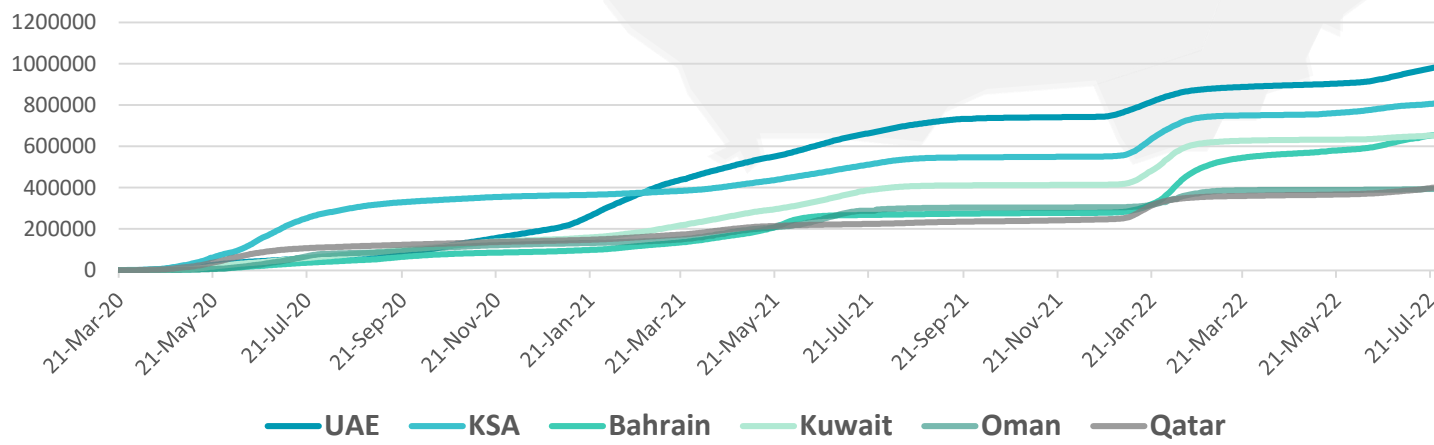
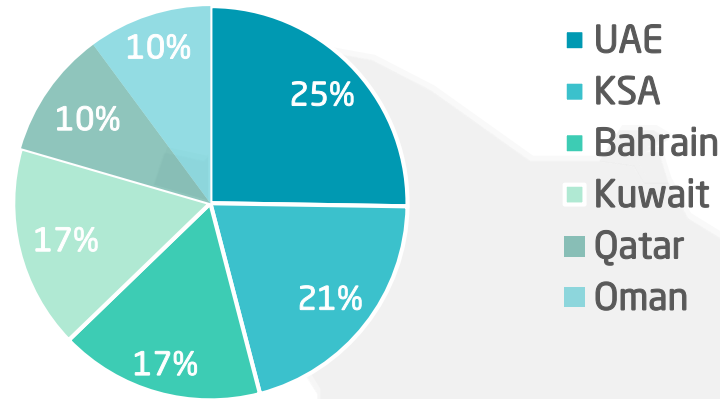
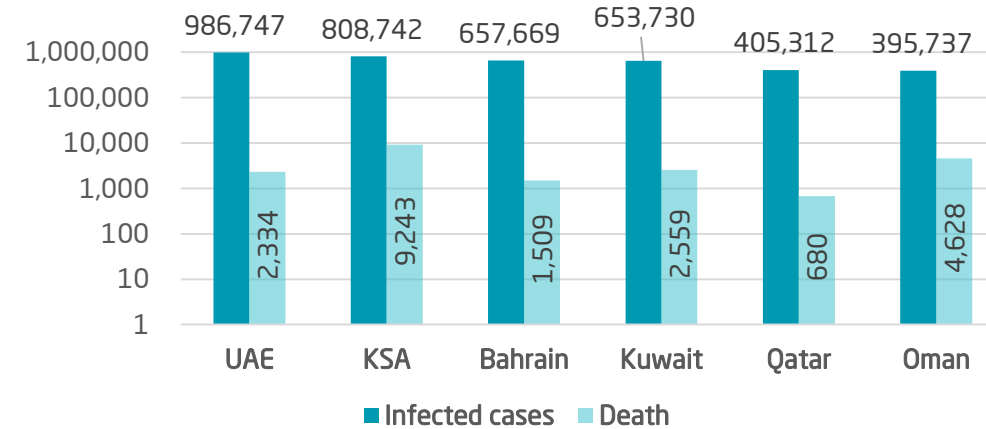


Figure 9: Comparative Analysis of the Distribution of COVID-19 Cases in GCC Countries

## TOTAL NUMBER OF INFECTED CASES



## TOTAL NUMBER OF INFECTED, RECOVERED AND DEATHS



## DEATHS PER MILLION

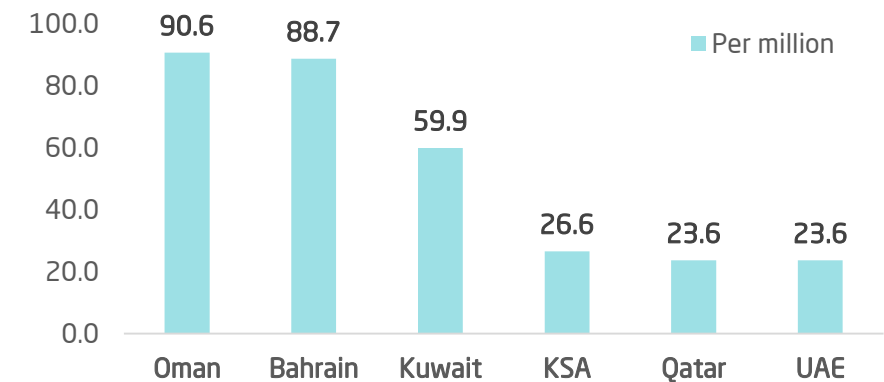




Figure 10: Comparative Analysis of the Distribution of COVID-19 New Cases in GCC Countries

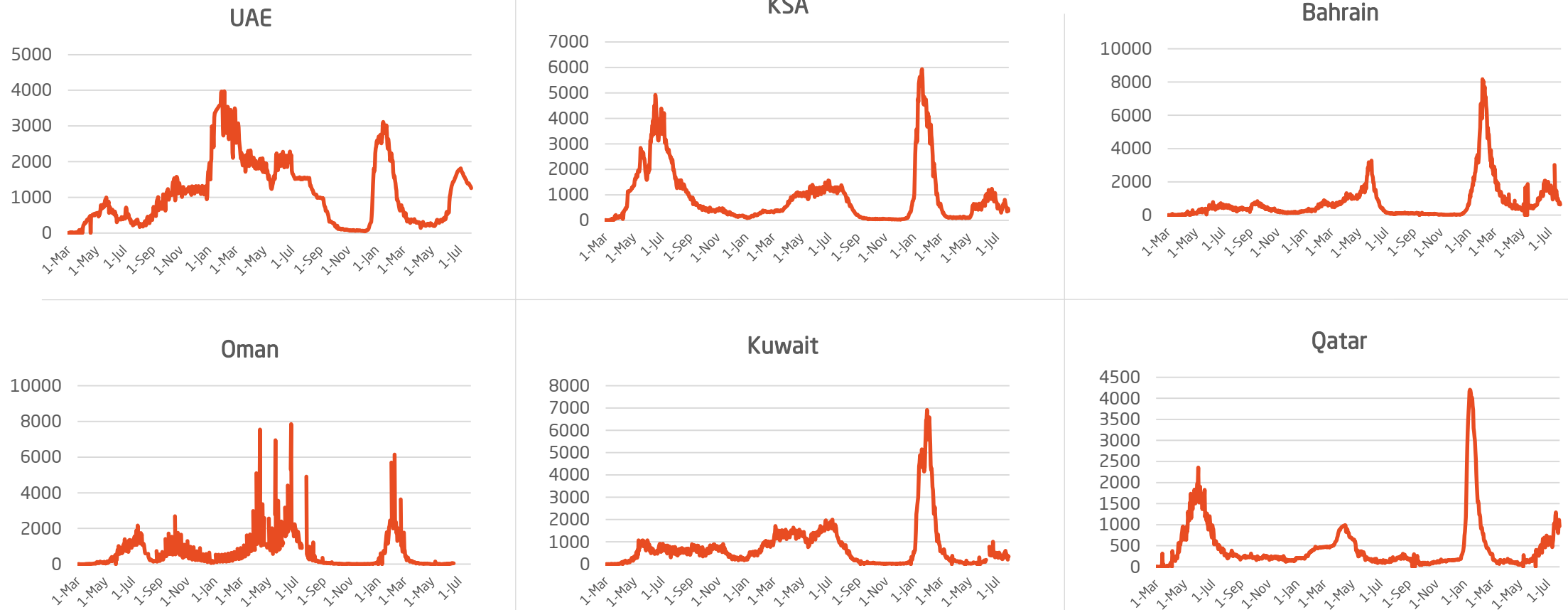
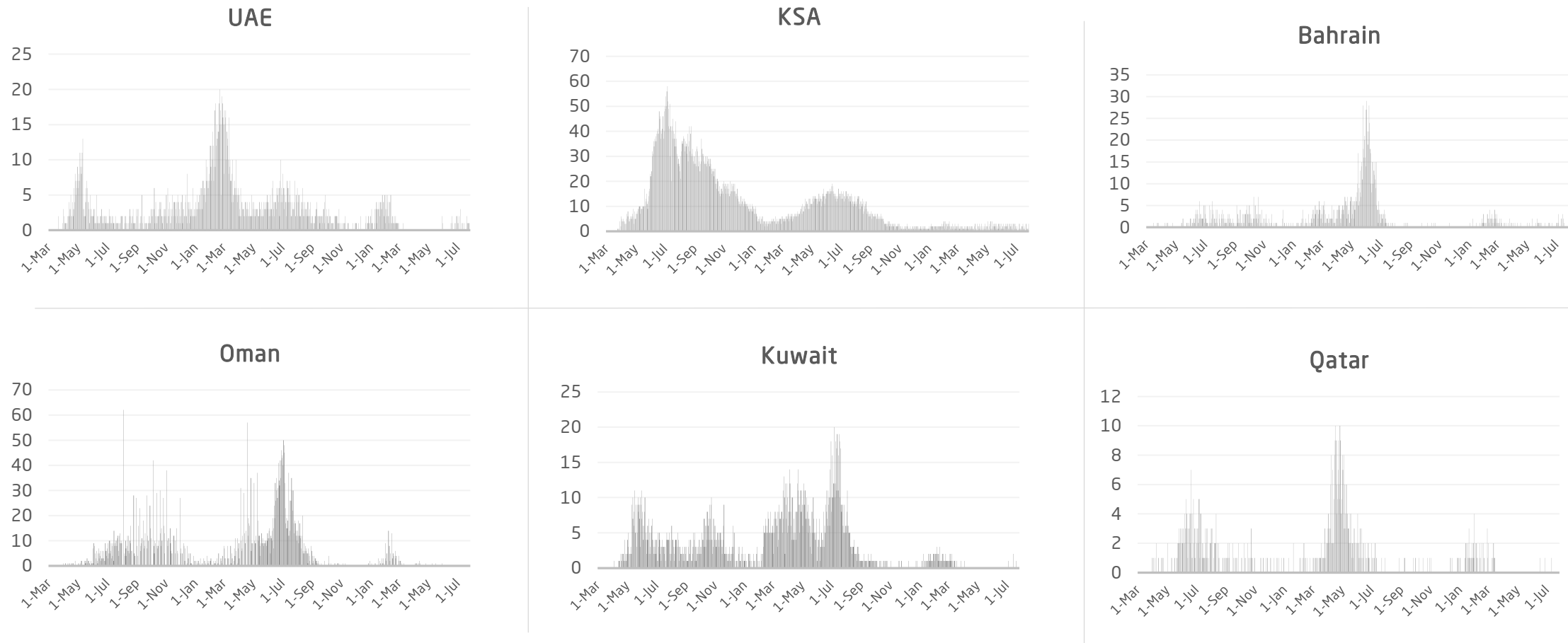




Figure 11: Comparative Analysis of the Distribution of COVID-19 New Death Cases in GCC Countries



## Coinfection with SARS-CoV-2 and Influenza A Virus Increases Disease Severity and Impairs Neutralizing Antibody and CD4+ T Cell Responses

Published

March 23, 2022 in [ASM Journals](#)

- **Importance:** Co-infection of COVID-19 with IAV poses a severe public health threat with increasing co-infection reports. This might worsen clinical outcome, COVID-19 severity and mortality rate.
- **Background:** COVID-19 mortality rate is about 2.1%, and emergences of various variants can make the pandemic worse. The IAV poses threat to the public health, especially in winter. Its co-infection with other respiratory viruses can increase the mortality rate.
- **Methods and Materials:** This study was conducted on K18-hACE2 mouse model and infected them with either COVID-19 or IAV H1N1 viruses. Mice were distributed into 5 groups (n=3 per group): control, IAV only, COVID-19 only, IAV infection prior to COVID-19 (IAV + COVID-19), and COVID-19 infection prior to IAV infection (COVID-19 + IAV), with a 3-day interval in the coinfection. Statistical significance was determined by two-way ANOVA/Tukey.
- **Result of Coinfection of COVID-19 and IAV: Enhances disease severity** - Subjects were monitored for their body weight and survival rate for 12 days postinfection (dpi). The control group maintained their body weight and 100% survival rate. IAV only group showed worse body weight decline and survival rate compared to COVID-19 only group. Co-infection groups showed worse decline in body weight compared to other groups, with 100% mortality rate.
- **Prolongs virus infection in lungs and bronchoalveolar lavage fluid (BALF)** - lung and BALF were collected for virus titers. IAV only titers remained high until 5 dpi while 10 dpi in IAV + COVID-19 group. However, IAV titers in COVID-19 + IAV remained lower when compared to IAV only group. COVID-19 only titers was at the highest at 2 dpi until 5 dpi but remained high in COVID-19 + IAV until 7 dpi. However, COVID-19 titers in IAV + COVID-19 were lower than COVID-19 only group. These shows primary infection persists longer in co-infection but shows lower titer rates when it is as secondary infection.
- **Causes unbalanced immune response in the lung and peripheral blood** - IAV only CD45+ cells were high from 2 dpi until 10 dpi, but higher with COVID-19 from 5 dpi until 10 dpi. IAV + COVID-19 showed rapid increase of CD45+ compared to IAV only, while COVID-19 + IAV showed lower increase of CD45+ compared to COVID-19 only. COVID-19 only showed slower kinetics of monocytes and B-cells compared to IAV only group at 2 dpi, but has higher cell numbers at 5 dpi. No difference in kinetics with CD4+ and CD8+ T-cells between only groups. IAV + COVID-19 showed higher monocytes, B cells, CD4+ and CD8+ T-cells compared to COVID-19 + IAV at 7 and 10 dpi. In addition, IAV and COVID-19 co-infection showed severe lymphopenia in peripheral blood.
- **Increased severity of lung damage following COVID-19 and IAV co-infection** - IAV only showed rapid increase in inflammatory marker (TNF- $\alpha$ , IL-1 $\alpha$ , IL-6 and IFN- $\beta$ ), while COVID-19 only showed moderate increase but lower expression. COVID-19 + IAV showed rapid increase of the markers and significantly higher cytokine expression amount than in IAV + COVID-19.
- **Severe lymphopenia in coinfecting mice causes reduced neutralizing antibody and T cell responses** - COVID-19 + IAV co-infection can induce severe lymphopenia the impaired production of IgG and NAbs against COVID-19 and IAV. Coinfection of COVID-19 and IAV significantly alters the CD4+ T-cell responses against each virus.
- **Conclusion:** Co-infection in mice showed increased mortality, higher cytokines and chemokines levels but lower virus-specific and neutralizing antibodies compared with the mice with single infection.



### Background

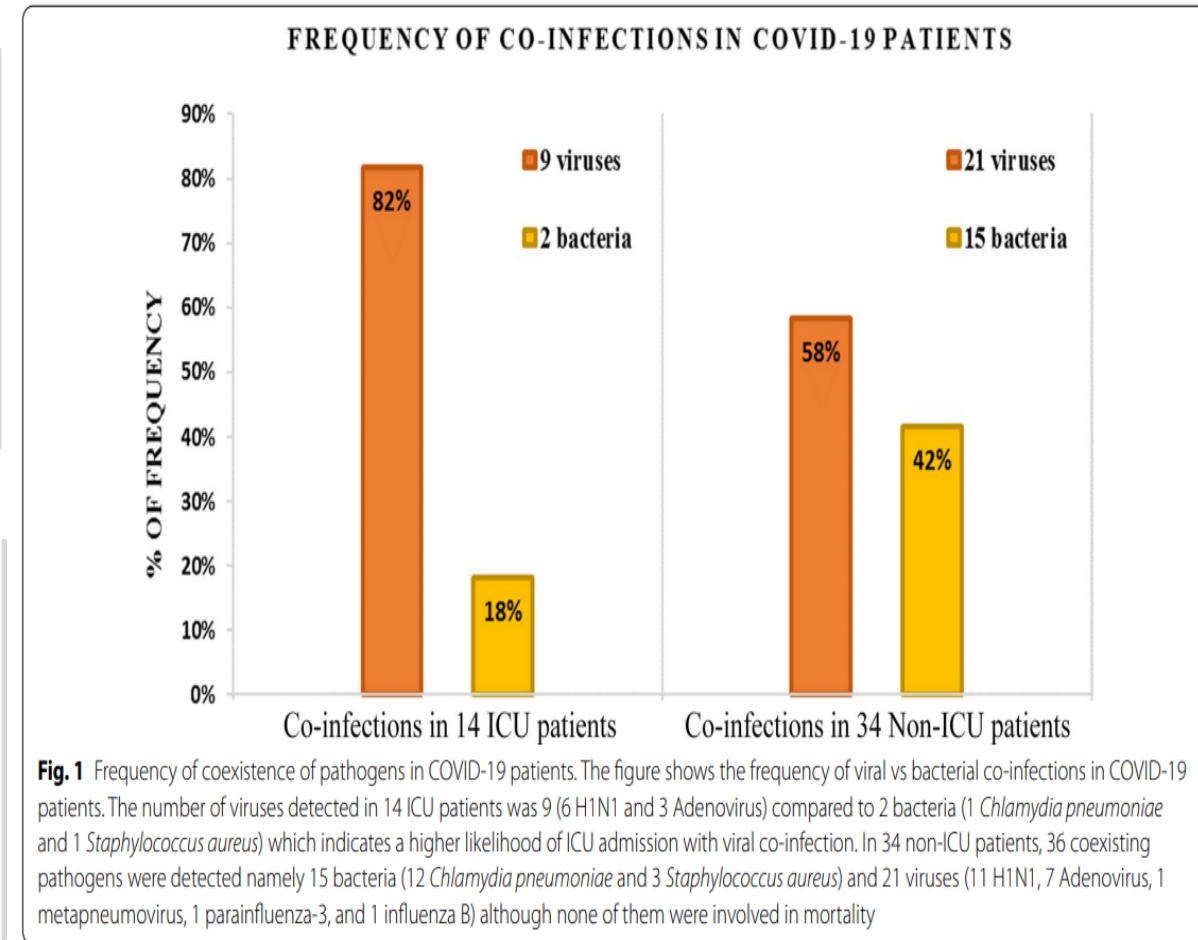
- Co-infection of COVID19 and influenza can go unnoticed and could be harmful. Viral co-infection is less frequent than bacterial co-infection. The most common co-infection with COVID19 are Mycoplasma pneumoniae, Pseudomonas aeruginosa, Hemophilus influenza and Chlamydia pneumonia. COVID-19 disease severity has been associated with comorbidities such as hypertension, diabetes, chronic kidney disease and heart failure. COVID-19 pneumonia has a strong association with cardiovascular disease (14.4%), followed by hypertension (18.6%) and diabetes (11.9%). Such comorbidities can increase hospitalization, prolong ICU stay and mortality. This article was conducted in Saudi Arabia to investigate the effects of both viral and bacterial co-infection in COVID-19 clinical outcomes.

### Methods

- This paper is retrospective study of patients (n=48) who are admitted to the hospital. Fourteen patients were in ICU and the rest (34 patients) had mild cases. Nine of the admitted ICU patients died and the rest survived.

### Statistics

- All data are expressed as continuous variables. Continuous data was expressed as median for normally distributed variable and absolute numbers as percentage. Paired t-test was utilized for comparison of continuous variables. Pearson Coefficient was utilized to test the association between the variables. Linear regression with best fitted model was utilized to show the relationship between the response and several predictors. MANOVA was expressed as p-value to analyze mortality in co-infection and patients with comorbidities. Statistically significant was considered for a 2-sided alfa of less than 0.05.



## Continued

### Results

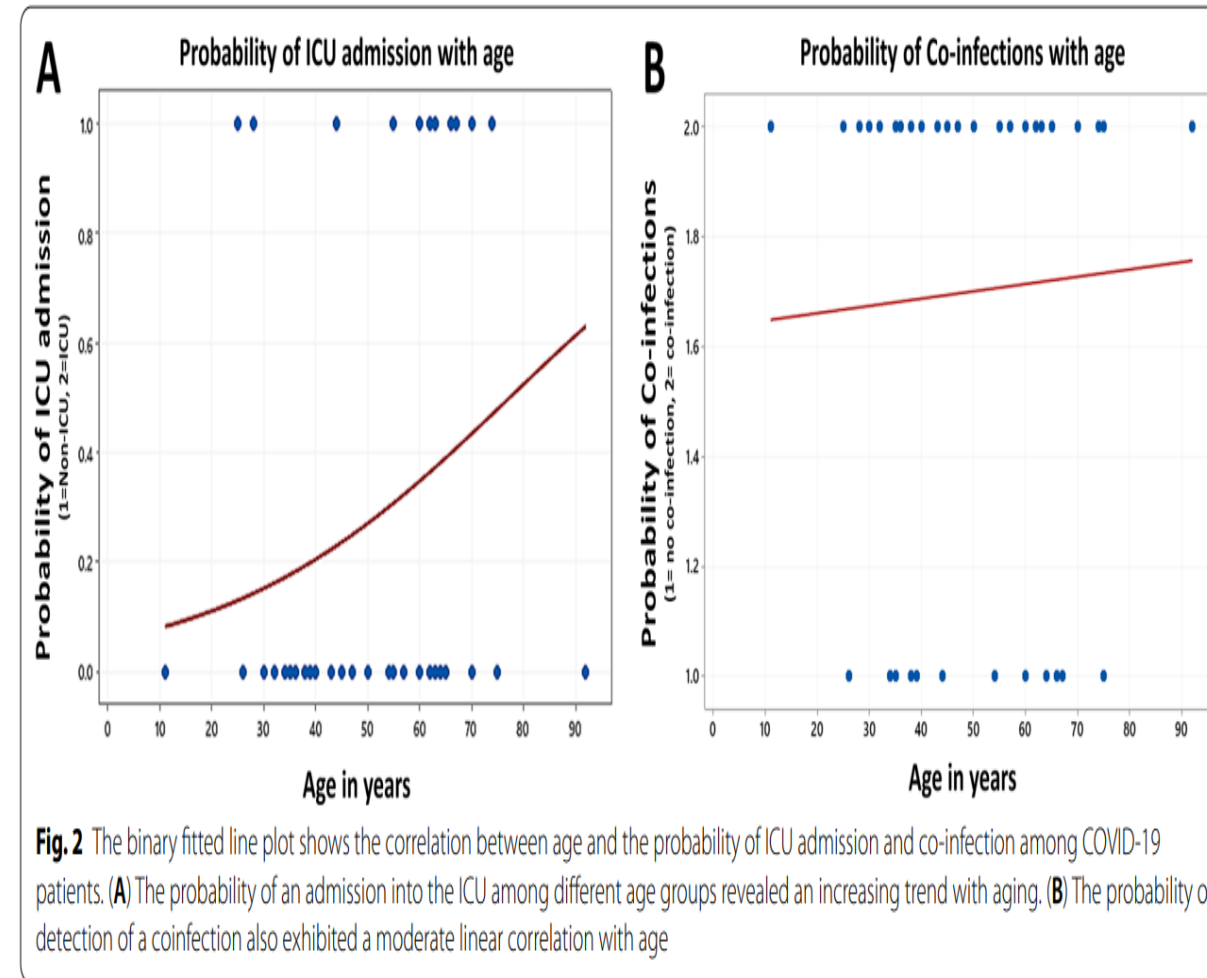
- The ratio of male to female was 3:1 with a median age of 52 years-old (1-92). Thirty-four (71%) has co-infections where influenza A H1N1 (17 patients, 36%) was the most common co-infection, followed by Chlamydia pneumonia (13 patients, 28%). It was suggested that 62% (21/34) patients may have triple co-infection. 19% (9/48) of the patients died, where 6/9 of them had co-infection. Viral co-infection had higher mortality rate compared to bacterial co-infection, but it was not statistically significant. There was no statistical significant association between the comorbidities and mortality in the MANOVA test except with diabetes ( $p=0.02$ ). Linear regression analysis showed that only Troponin T ( $p=0.001$ ) compared to other COVID-19 blood markers (LDH  $p=0.12$ , d-dimer  $p=0.25$ ) was strongly related with disease severity and can be used as a predictor.

### Discussion

- These results are supported by several studies showing viral co-infection are associated with disease severity, acute respiratory distress syndrome and death. This can be due to the induction of strong inflammatory cytokine/chemokine response known as cytokine storm. In addition, secondary bacterial co-infection can contribute to higher mortality rate in patients with viral pneumonia. This paper has some limitations like small sample size, and did not include asymptomatic or pre-symptomatic cases or healthy non-COVID-19 controls.

### Conclusion

- It's challenging to determine the impact of COVID-19 and influenza on ICU admission and mortality due to the similarities in their symptoms. This study demonstrates the importance of screening of co-infection and influenzas viruses vaccinations.



**Fig. 2** The binary fitted line plot shows the correlation between age and the probability of ICU admission and co-infection among COVID-19 patients. (A) The probability of an admission into the ICU among different age groups revealed an increasing trend with aging. (B) The probability of detection of a coinfection also exhibited a moderate linear correlation with age



## SARS-CoV-2 and Influenza Virus Co-Infection Cases Identified through ILI/SARI Sentinel Surveillance: A Pan-India Report

Published

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- SARS-CoV-2/influenza virus co-infection studies have focused on hospitalized patients who usually had grave sequelae. SARS-CoV-2/influenza virus co-infection cases from both community and hospital settings reported through integrated ILI/SARI (Influenza Like Illness/Severe Acute Respiratory Infection) sentinel surveillance is established by the Indian Council of Medical Research.
- SARS-CoV-2 and influenza virus co-infections were reported from various parts of the world and are a concern due to the reported worsening of clinical signs and symptoms in such cases. In view of sporadic reports of high rates of co-infection of SARS-CoV-2 in India in July 2021, the Indian Council of Medical Research (ICMR) established a pan-India ILI/SARI surveillance network in 22 virus research and diagnostic laboratories (VRDLs) throughout the country, along with their clinical course and outcomes for a period of 7 months, 4 July 2021 to 31 January 2022 (Epi Week 27 of 2021-Epi week 4(+2 days) of 2022).
- Each laboratory (National Institute of Virology-NIV Pune, Referral labs, and testing labs) collects and tests 25 samples per week from consenting patients (15 ILI samples from community settings and 10 SARI samples from hospital settings). A COVID-19/influenza co-infection case was defined as an individual fulfilling the WHO case definition of ILI/SARI and testing positive for COVID-19 along with influenza A or B virus.
- Samples are tested by a two-step rRT-PCR kit designed by ICMR-NIV, for simultaneous qualitative detection and differentiation of influenza viruses and SARS-CoV-2. The first step of the assay detects virus type (influenza A/influenza B/SARS-CoV-2), and the second step differentiates between influenza virus subtypes. A dedicated ILI/SARI surveillance portal has been developed and all the network laboratories enter demographic, clinical, hospitalization, management, and outcome details of the patients along with laboratory testing results on the portal on a weekly basis. Real-time information on trends of influenza and SARS-CoV-2 activity, lineage-wise positivity, seasonal variations, and unsub-typeable strains are generated for both hospital and community samples. Co-infection cases were identified from the ICMR influenza portal in real-time, and patients were interviewed via phone calls and hospital visits.
- Results during the study period are acquired from a total of 13,467 ILI/SARI samples tested by the network, out of which 8776 and 4691 were from the community and hospital settings, respectively. A total of 416, 593, and 770 samples were positive for influenza A, B, and SARS-CoV-2, respectively. A total of 8 cases of co-infection were detected during the study period—5 cases with COVID-19 and influenza co-infection and 3 cases with influenza A/B dual infection.





## Continued

- Case 1: an eight-year-old child developed fever and dry cough and tested positive for influenza A H3N2 and SARS-CoV-2 three days after onset of symptoms. He was managed at home, and his illness resolved within two days with symptomatic management. He did not require the administration of oxygen. His childhood immunization schedule was complete as per age.
- Case 2: an 18-month-old girl with a previous history of febrile seizures was hospitalized by her parents where her fever resolved within a day of admission. She was kept under observation and discharged on the third day. She did not require intensive care or oxygen administration, nor did she develop seizures during her illness. She tested positive for COVID-19 and influenza B Victoria. Her childhood immunization schedule was complete for her age.
- Case 3: a 1-year-old boy presented with fever, cough, running nose, shortness of breath, and stridor at rest, was hospitalized. He was diagnosed with pneumonia and had to be administered oxygen to maintain saturation at 98%. He was hospitalized for 12 days and did not require intensive care. He tested positive for COVID-19 and influenza B Victoria. His childhood immunization schedule was complete for his age.
- Case 4: an 18-year-old girl developed fever, cough, and running nose and tested positive for influenza B Victoria and SARS-CoV-2 2 days after onset of symptoms. She was managed at home, and her symptoms resolved within 10 days. She had not received the influenza or COVID-19 vaccine.
- Case 5: a 74-year-old male, a known case of COPD and CKD, was admitted with fever, shortness of breath, productive cough, and running nose 2 days after the development of symptoms. He was admitted with the differential diagnoses of lower respiratory tract infection/acute exacerbation of COPD/Acute chronic kidney disease. On examination, he was conscious, and oriented, with a pulse rate of 82/minute, BP 120/70 mm Hg with bilateral lung crepitations and rhonchi. He had deranged renal functions and hyperkalemia and had to undergo dialysis, following which his health improved. His chest X-ray showed bilateral infiltrates with cardiomegaly and pulmonary edema, and chest CT scan findings were suggestive of bronchiectasis. He tested positive for COVID-19 and influenza A H3N2. He was hospitalized for 18 days and did not require intensive care or oxygen support. He is not vaccinated for influenza last year, and his COVID-19 vaccination status was unknown.
- The three influenza A/B dual infection cases were from a 6-year-old child, a 30-year-old male, and a 23-year-old female. The child had mild symptoms (fever, dry cough, and running nose) for 4-5 days and was managed at home, while both adult patients were hospitalized due to other causes. Both patients were admitted to the same hospital, developed fever, and tested positive during their hospital stay. Both recovered and were discharged after redressal of the primary etiology. All three cases were co-infected with influenza A H3N2 and influenza B Victoria lineage viruses.



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