

Demographic and Clinical Characteristics of COVID-19 Reinfection

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Abstract

Background: COVID-19 reinfection is generally defined as having 2 positive SARS-CoV-2 tests greater than 90 days apart. The clinical implications and impact of COVID-19 reinfection are not completely understood. We evaluated clinical and demographic characteristics of patients with COVID-19 reinfection.

Methods: All SARS-CoV-2 polymerase chain reaction (PCR) tests performed at Joint Base San Antonio (JBSA), from March 27, 2020 through January 19, 2022 were analyzed. COVID-19 reinfection was defined as having 2 positive PCR tests >90 days apart. Available data for comorbidities, travel, COVID-19 vaccination status, SARS-CoV-2 genotype, symptoms, hospitalization, and treatments were compared for first and second infections.

Results: A total of 310,704 SARS-CoV-2 PCR tests performed of which 25,543 (8.2%) were positive at JBSA during the study period. Patients with COVID-19 reinfection (n=532; 4.2%) were identified and 266 (50%) charts reviewed. The mean age was 36.5 (±15) years and approximately half were males and active duty members (Table 1). The median time from first to second infection was 326 days (IQR 160-385). Patients were predominantly unvaccinated (91.4%) at initial infection, however unvaccinated status was less common (40.2%) at second infection (40.2%; P<0.0001). A significantly higher proportion of patients were symptomatic at first infection (88.3%) compared to second infection (51.5%; P<0.001). Pneumonia diagnosis was significantly higher (4.9% vs. 0.4%; P=0.0011) whereas hospitalization was similar (2.6% vs. 2.3%; P=0.0788) for first compared to second infection. Among hospitalized patients, critical illness was common for first infection (57.1%) but none of the patients were critically ill with their second infection. A third episode of infection was rarely observed (1.5%). Of 80 genotype samples available, 14 (30%) were paired samples. Among all paired samples different genotypes were responsible for reinfection (Table 2).

Conclusions: Patients with COVID-19 reinfections were less likely to be symptomatic, had lower severity of illness, and typically had a different SARS-CoV-2 genotype at second infection. Reinfection occurred despite COVID-19 vaccination in many patients, which highlights the need to develop novel strategies for vaccination.

Background

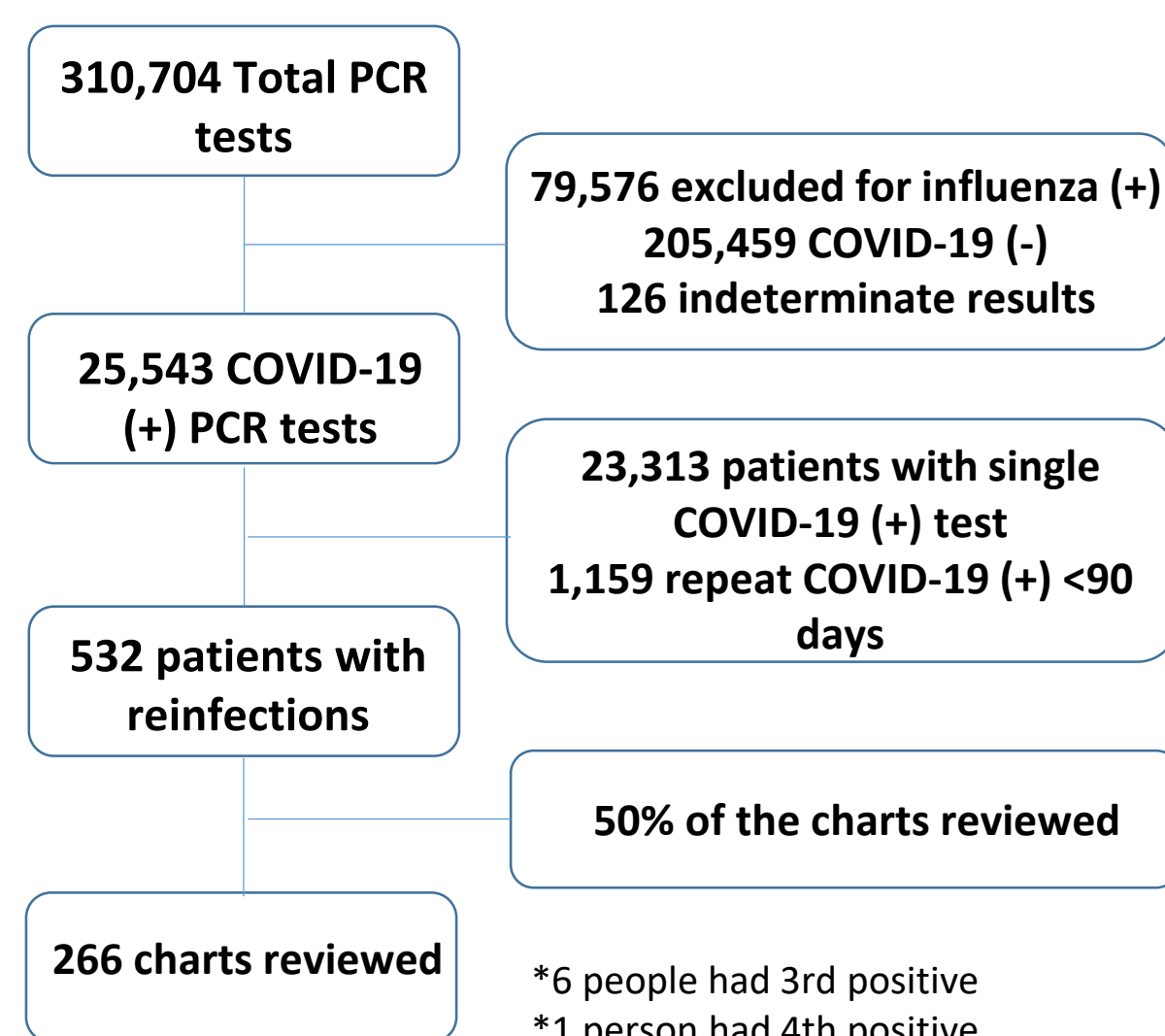
- Understanding the risk, timing, and severity of COVID-19 reinfection remains a focus of investigation
- The case definition of reinfections has changed as variants emerge

Methods

- We conducted a retrospective audit of SARS-CoV-2 (PCR) tests performed at JBSA from 3/27/20- 1/19/22 for reinfections
- We defined COVID-19 reinfection as two positive PCR tests >90 days apart
- Available data for comorbidities, travel, COVID-19 vaccination status, genotype, symptoms, hospitalization, and treatments were compared

Results

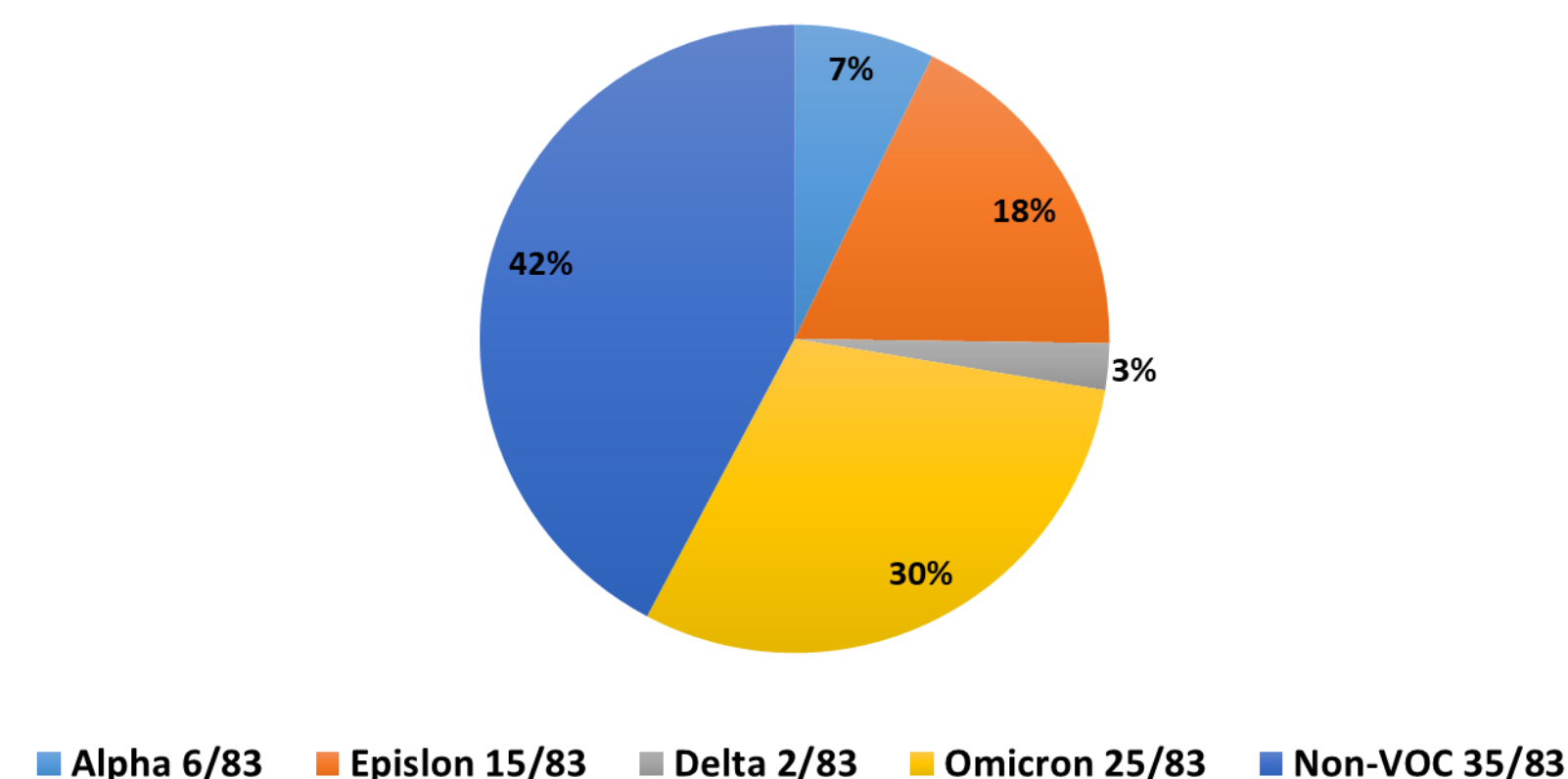
Figure 1



Results (continued)

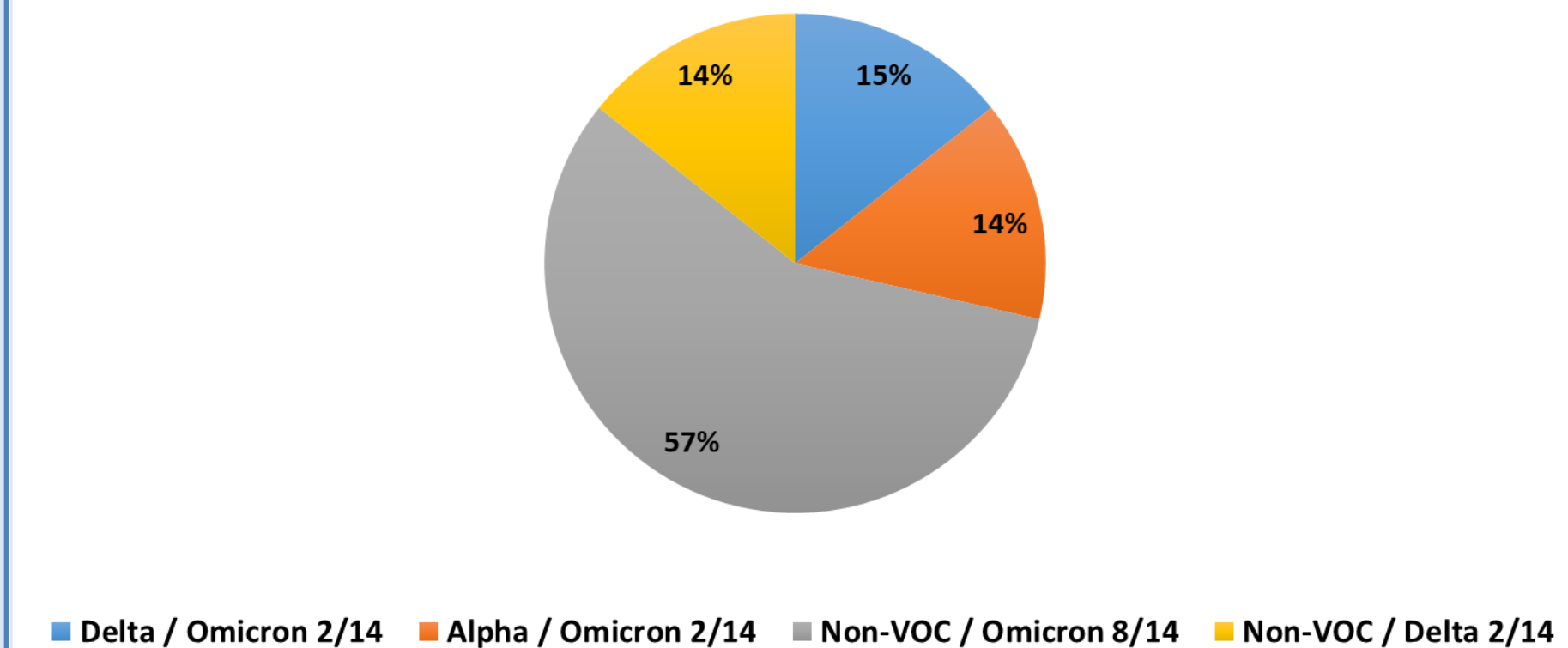
Table 1: Demographic and Clinical Characteristics			
Total patients, N	266		
Total patients with 2 reinfections, N (%)	4 (1.5%)		
Male	142 (53.4%)		
Female	124 (46.6%)		
Active Duty	125 (47.0%)		
Reserve/Guard	7 (2.6%)		
Healthcare worker	35 (13.1%)		
Barracks dweller or military	12 (4.5%)		
Nursing home resident	1 (0.4%)		
Comorbidities ^a	145 (54.5%)		
Median time between 1st and 2nd infection (days with IQR)	326 (160-385)		
Median time between 2nd and 3rd infection (days with IQR)	237 (158-321)		
	1st infection	2nd infection	3rd infection
Median age, with IQR	36 (25-47)	37 (26-48)	74 (57-79)
Symptomatic	235 (88.3%)	137 (51.5%)	1 (25%)
Asymptomatic	21 (7.9%)	47 (17.7%)	2 (50%)
Known contact	122 (45.9%)	57 (21.4%)	1 (25%)
Developed pneumonia	13 (4.9%)	1 (0.4%)	0
Hospitalized	7 (2.6%)	6 (2.3%)	1 (25%)
Severe or critical COVID-19 illness	4 (1.5%)	0	0
COVID-19 vaccination status ^{b,c}			
Unvaccinated	243 (91.4%)	107 (40.2%)	2 (50.0%)
Partially vaccinated	21 (7.9%)	147 (55.3%)	2 (50.0%)
Fully vaccinated	2 (0.8%)	11 (4.1%)	0
IQR - interquartile range			
*P-values calculated for 1st and 2nd COVID-19 infections			
^a Defined as cardiovascular, cerebrovascular, chronic respiratory illness, chronic kidney, chronic liver, diabetes, hypertension, obesity, rheumatologic, cancer (solid or blood) - diseases, pregnancy, or seasonal allergies			
^b Partially vaccinated defined as 1 Johnson and Johnson; 1 or 2 Moderna/Pfizer/unknown vaccine doses			
^c Fully vaccinated defined as 3 Moderna or Pfizer vaccine doses			

Figure 2: COVID-19 Reinfection Sequencing Profile



Results (continued)

Figure 3: COVID-19 Sequenced Pairs



Conclusions

- Patients with COVID-19 reinfections were less likely to be symptomatic and had lower severity of illness with second infection
- All sequenced SARS-CoV-2 samples indicated a different genotype with reinfection
- Despite COVID-19 vaccination in many patients, reinfections continued to occur and increased as new variants emerged
- The current vaccination and prevention strategies need to continue to evolve as new variants emerge

Limitations

- This cohort included a single military treatment facility
- We analyzed a small number of paired genotypes due to sample availability
- Patients may have sought treatment at another facility
- Data collection and analysis stopped early during Omicron surge

Disclaimer / Funding Statement

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