2019-nCoV Literature Situation Report (Lit Rep)

May 6, 2021

The scientific literature on COVID-19 is rapidly evolving and these articles were selected for review based on their relevance to Washington State decision making around COVID-19 response efforts. Included in these Lit Reps are some manuscripts that have been made available online as pre-prints but have not yet undergone peer review. Please be aware of this when reviewing articles included in the Lit Reps.

Key Takeaways

- **The Pfizer-BioNTech vaccine was estimated to be 90% effective against the B.1.1.7 SARS-CoV-2 variant and 75% effective against the B.1.351 variant 14 days or more after the second dose in Qatar. Estimated vaccine effectiveness against severe, critical, or fatal SARS-CoV-2 infection caused by any variant was 97%.** More
- **The Pfizer-BioNTech vaccine was associated with 86%-90% lower incidence of asymptomatic SARS-CoV-2 infection 7 days or more after the second dose among cohorts of healthcare workers in the US and Israel, with even lower incidence of symptomatic infection.** More and More
- **The Pfizer-BioNTech vaccine was estimated to be 95% effective against SARS-CoV-2 infection 7 days or more after the second dose according to national surveillance data from Israel (n=4.7 million) between January to April 2021, and 92% effective against asymptomatic infection. During the analysis period, 95% of positive specimens were likely B.1.1.7 infections.** More
- **In a phase2a-b trial in South Africa, the NVX-CoV2373 (Novavax) nanoparticle vaccine indicated a 49% vaccine efficacy against SARS-CoV-2 infection among participants without anti-SARS-CoV-2 antibodies at baseline (n=2,684, 6% HIV-positive). An estimated 93% of infections were caused by the B.1.351 variant.** More

Non-Pharmaceutical Interventions

- A survey conducted among residents in rural Michigan (n=150) found that those classified as being at high risk for COVID-19 did not respond significantly differently regarding their level of concern about the pandemic or protective behaviors compared to healthy controls. Among high-risk individuals, no significant differences were observed between those who acknowledged their status (n=73) and those who denied it (n=29). High-risk deniers more frequently reported rarely or never practicing protective behaviors compared to controls or high-risk acknowledgers, though this was not a statistically significant difference.

  Greathouse et al. (2021). Revelations from the Clinic: Protective Behaviors and Perceptions among People at High Risk for Severe Illness from COVID-19. Journal of Primary Care & Community Health. https://pubmed.ncbi.nlm.nih.gov/33949247

Testing and Treatment

- *[Pre-print, not peer-reviewed]* Large-scale implementation of pooled testing for routine screening of asymptomatic SARS-CoV-2 infection was demonstrated to be feasible across 592 schools in Massachusetts between January and April 2021. During the study period, 259,726 individuals were

tested across 50,636 pools (mean swabs per pool = 7) with a median turnaround time of 21 hours. The pool positive rate was 0.8%. Among positive pools (mean cycle threshold for N1 viral target was 26.1), deconvolution using the BinaxNOW rapid antigen test to detect a positive individual within the pool was successful in 93% of pools. Less than 1% of samples resulted in unsatisfactory specimens. An evaluation survey identified the need for additional staffing support for successful program implementation.

Pollock et al. (May 5, 2021). Implementation of SARS-CoV2 Screening in K-12 Schools Using In-School Pooled Molecular Testing and Deconvolution by Rapid Antigen Test. Pre-print downloaded May 6 from https://doi.org/10.1101/2021.05.03.21256560

Vaccines and Immunity

- The Pfizer-BioNTech vaccine was 90% effective against PCR-confirmed infection with the SARS-CoV-2 variant B.1.1.7 and 75% effective against the B.1.1351 variant 14 days after the second dose, according to a nationwide case-control analysis in Qatar through March 2021. Individuals with positive and negative PCR tests were matched on demographics and reason for PCR testing to account for differences in health-seeking behavior. A separate cohort analysis comparing incidence of infection in vaccinated persons and in a national cohort who were SARS-CoV-2 antibody-negative supported the findings with an estimated vaccine effectiveness of 87% against the B.1.1.7 variant and 72% against the B.1.351 variant. Vaccine effectiveness against severe, critical, or fatal SARS-CoV-2 infection from infection with any variant was 97%. Researchers were able to assess vaccine effectiveness against infection from variants of concern because by March 2021 in Qatar, roughly half of sequenced cases were B1.351 infections and roughly 45% were B.1.1.7 infections. Breakthrough infections have been recorded in 1,616 of 265,410 (0.6%) persons vaccinated with two doses.

  Abu-Raddad et al. (May 2021). Effectiveness of the BNT162b2 Covid-19 Vaccine against the B.1.1.7 and B.1.351 Variants. The New England Journal of Medicine. https://doi.org/10.1056/NEJMc2104974

- The Pfizer-BioNTech vaccine was associated with a 93% lower incidence of symptomatic SARS-CoV-2 infection and 86% lower incidence of asymptomatic infection more than 7 days after the second dose in a retrospective cohort of healthcare workers (HCWs) in Israel (n=6,710). The median follow-up period was 63 days. While vaccination was associated with older age and male sex, a sensitivity analysis using propensity score matching found similar results. HCWs with prior SARS-CoV-2 infection were excluded from the study.

  Angel et al. (May 6, 2021). Association Between Vaccination With BNT162b2 and Incidence of Symptomatic and Asymptomatic SARS-CoV-2 Infections Among Health Care Workers. JAMA. *https://jamanetwork.com/journals/jama/fullarticle/2779853*

- Antibodies induced by the Pfizer-BioNTech vaccine had higher binding capacities (avidity) than antibodies induced by natural infection against the receptor binding domain (RBD) containing mutations representative of circulating SARS-CoV-2 variants of concern (N501Y, K417N, E484K, and a combination of all three). Vaccine-induced sera (n=6) had 2.5- to 3-fold reduced binding to a RBD containing the N501Y and K417 mutations when compared to a wild type RBD. Of note, both the RBD with E484K mutation and RBD with all three mutations reduced binding by 10-fold, indicating that E484K mutation (found in the B.1.351 and P.1 variant but not in the B.1.1.7 variant) substantially reduces antibody binding. *[EDITORIAL NOTE: An earlier version of this manuscript was summarized as a pre-print in the report on March 16, 2021].*

Chang et al. (May 5, 2021). BNT162b2 MRNA COVID-19 Vaccine Induces Antibodies of Broader Cross-reactivity than Natural Infection but Recognition of Mutant Viruses Is up to 10-fold Reduced. Allergy. https://doi.org/10.1111/all.14893

- Estimated real-world vaccine effectiveness 7 days or more after the second dose of the Pfizer-BioNTech vaccine was 95% against SARS-CoV-2 infection according to analysis of national surveillance data from Israel (n=4.7 million) between January to April 2021After adjustment for age, sex, and week of infection, estimated vaccine effectiveness was 92% against aymptomatic infection and 97% against symptomatic infection. The authors calculated that vaccination lead to a 97% reduction in COVID-19-related hospitalization and a 97% reduction in i COVID-19-related death. 95% of tested specimens from a nationwide convenience sample (n=8,472) during the analysis period showed spike gene target failure, indicating a high prevalence of infections caused by the B.1.1.7 variant.

  Haas et al. (May 6, 2021). Impact and Effectiveness of MRNA BNT162b2 Vaccine against SARS-CoV-2 Infections and COVID-19 Cases, Hospitalisations, and Deaths Following a Nationwide Vaccination Campaign in Israel: An Observational Study Using National Surveillance Data. The Lancet. https://doi.org/10.1016/S0140-6736(21)00947-8

- Results from a multicenter, randomized, observer-blinded, placebo-controlled phase 2a-b trial in South Africa of the NVX-CoV2373 (Novavax) nanoparticle vaccine indicated a 49% vaccine efficacy against SARS-CoV-2 infection among 2,684 participants. 94% of participants were HIV-negative and 6% were people living with HIV. After 1:1 vaccine to placebo randomization, 15 participants in the vaccine arm and 29 participants in the placebo arm developed predominantly mild to moderate COVID-19. Efficacy in HIV-negative participants was 60% and did not differ by presence of antibodies at baseline. Among individuals who developed COVID-19 and had a sequenced viral isolate, 38 (93%) of 41 were the B.1.351 variant and post-hoc vaccine efficacy against B.1.351 was 51% among the HIV-negative participants.
- Notably, among placebo recipients the incidence of symptomatic COVID-19 was similar in those with and without evidence of anti-SARS-CoV-2 antibodies at baseline during the first 2 months of follow-up (5.3% vs 5.2%). The authors conclude that this suggests prior infection provided no protection against developing clinical disease when infected with the B.1.351 variant. *[EDITORIAL NOTE: An earlier version of this manuscript was summarized as a pre-print in the report on March 3, 2021].*

  Shinde et al. (May 5, 2021). Efficacy of NVX-CoV2373 Covid-19 Vaccine against the B.1.351 Variant. New England Journal of Medicine. https://doi.org/10.1056/NEJMoa2103055

- Vaccination with the Pfizer-BioNTech vaccine was associated with a 72% lower incidence of a positive SARS-CoV-2 PCR result during routine weekly screening for asymptomatic infection among employees of St. Jude Children's Research Hospital between December 2020 to March 2021 and a greater than 90% reduction in PCR positivity among fully vaccinated individuals. Incidence of asymptomatic infection during screening was 42% lower among vaccinated individuals compared to unvaccinated individuals within the first 11 days after the first dose, 65% lower within the first 7 days after the second dose, and 90% lower 7 days or more after the second the dose. No symptomatic infections were detected among vaccinated individuals more than 7 days after the second dose.

  Tang et al. (May 6, 2021). Asymptomatic and Symptomatic SARS-CoV-2 Infections After BNT162b2 Vaccination in a Routinely Screened Workforce. JAMA. *https://jamanetwork.com/journals/jama/fullarticle/2779854*

Clinical Characteristics and Health Care Setting

- Mean viral load (VL) was slightly lower at the time of SARS-CoV-2 infection diagnosis for children aged 0-13 years (6.2 $\log_{10}$ copies/mL) and adolescents aged 14-19 years (6.4 $\log_{10}$ copies/mL) compared to adults aged ≥20 years (6.7 $\log_{10}$ copies/mL) in a study in Switzerland (n=8,027). At time of diagnosis, the proportion of adults with VL > 6 $\log_{10}$ copies/mL (defined threshold for infectious virus) was significantly higher when compared to children (69% vs 58%). Analysis of VL kinetics, using day of symptom onset as an anchor, show that VL peaked within 3 days post symptom onset, with VL in children peaking and declining slightly faster compared to adults. All groups presented with VL > 6 $\log_{10}$ copies/mL up to 5 days post symptom onset.

  Bellon et al. (May 5, 2021). SARS-CoV-2 Viral Load Kinetics in Symptomatic Children, Adolescents and Adults. Clinical Infectious Diseases. https://doi.org/10.1093/cid/ciab396

- In a sample of 191 COVID-19 patients presenting to the emergency department, viral RNA detected in blood (RNAemia) by digital PCR (dPCR) was associated with poor clinical outcomes. DCR was more sensitive than quantitative PCR (qPCR) in detecting RNAemia, or viral RNA in plasma (23% vs 1.4%). RNAemia was undetectable within 10 days of symptom onset, clinical severity peaked within 16 days, and symptoms resolved within 33 days for most patients with serial measurements. RNA load correlated with maximum severity, and initially RNAemic patients were more likely to have severe disease, worsening of disease severity, and extrapulmonary complications.

  Ram-Mohan et al. (May 5, 2021). SARS-CoV-2 RNAemia Predicts Clinical Deterioration and Extrapulmonary Complications from COVID-19. Clinical Infectious Diseases. https://doi.org/10.1093/cid/ciab394

Modeling and Prediction

- *[Pre-print, not peer-reviewed]* A SARS-CoV-2 transmission model calibrated to California state prisons predicts that if a viral variant is introduced in a prison with moderate vaccine coverage, and no baseline immunity that has resumed pre-2020 contact levels, 23-74% of residents could be infected over 200 days. Cumulative infections may be reduced to 2-54% if high vaccination coverage and non-pharmaceutical interventions (NPIs) are combined. Substantial infection risks are associated with dormitory-style prisons even with high vaccination coverage and NPI use unless there is high baseline immunity from prior infection. By contrast, less than 10% of residents in prisons with mostly cell housing are expected to be infected, even without baseline immunity. Prisons that house medically vulnerable populations are at increased hospitalization risks regardless of residential layout.

  Ryckman et al. (May 5, 2021). Outbreaks of Covid-19 Variants in Prisons A Mathematical Modeling Analysis of Vaccination and Re-Opening Policies. Pre-print downloaded May 6 from https://doi.org/10.1101/2021.05.03.21256525

Other Resources and Commentaries

- Researchers Tie Severe Immunosuppression to Chronic COVID-19 and Virus Variants – JAMA (May 5)
- Expanding Mail-Based Distribution of Drug-Related Harm Reduction Supplies Amid COVID-19 and Beyond – American Journal of Public Health (June)
- Reopening California : Seeking Robust, Non-Dominated COVID-19 Exit Strategies – Medrxiv (Apr 28)

- Is a Single COVID-19 Vaccine Dose Enough in Convalescents – Human Vaccines & Immunotherapeutics (May 5)
- COVID-19 and HIV Infection Co-Pandemics and Their Impact: A Review of the Literature – AIDS Research and Therapy (May 5)
- Changes in US Medicaid Enrollment During the COVID-19 Pandemic – JAMA Network Open (May 5)
- Equitable Access and Distribution of COVID-19 Vaccines for US Vulnerable Populations: Federal Health Center Program Perspective – American Journal of Public Health (June)
- COVID-19 Home Monitoring After Diagnosis and Health Care Utilization in an Integrated Health System – JAMA Health Forum (May 6)
- ROCCA Study Protocol and Interim Analysis on Safety of Sputnik V Vaccine (Gam-COVID-Vac) in the Republic of San Marino an Observational Study Using Active Surveillance – MedRxiv (May 5)
- Interplay between Emerging SARS-CoV-2 Variants and Pandemic Control – New England Journal of Medicine (May 5)
- Managing Passenger Flows for Seaborne Transportation during COVID-19 Pandemics – Journal of Travel Medicine (May 5)
- An Integrated Understanding of Long-Term Sequelae after Acute COVID-19 – The Lancet Respiratory Medicine (May 6)
- Recommendations for Delivering COVID-19 Vaccine in Jails: Evidence from Kansas, Iowa, Nebraska, and Missouri – American Journal of Public Health (June)
- Missing the Point — How Primary Care Can Overcome Covid-19 Vaccine "Hesitancy. – New England Journal of Medicine (May 5)
- Warp Speed for COVID-19 Drugs and Vaccines - Time to Re-Consider How We Use the Term "Children. – Clinical Infectious Diseases (May 5)
- Implementation of a Volunteer Contact Tracing Program for COVID-19 in the United States: A Qualitative Focus Group Study – PLOS ONE (May 5)
- State Strategies for Addressing Barriers During the Early US COVID-19 Vaccination Campaign – American Journal of Public Health (June)
- Within-Host Evolution of SARS-CoV-2 in an Immunosuppressed COVID-19 Patient a Source of Immune Escape Variants – MedRxiv (May 5)
- Stigma Is Associated With Widening Health Inequities: Challenges From the Current COVID-19 Pandemic – American Journal of Public Health (June)
- Emergency Use Authorizations (EUAs) Versus FDA Approval: Implications for COVID-19 and Public Health – American Journal of Public Health (June)

Report prepared by the UW Alliance for Pandemic Preparedness and Global Health Security and the START Center in collaboration with and on behalf of WA DOH COVID-19 Incident Management Team