High attack rate of COVID-19 in an organized tour group of vaccinated travelers to Iceland

Shmuel Benenson, MD, MSc [1] Miriam Ottolenghi, RN, MEM [1] Matan J Cohen, MD, PhD [2] Ran Nir-Paz, MD, [1] and Yonatan Oster, MD [1]

[1] The Faculty of Medicine, Hebrew University of Jerusalem, Israel; Department of Clinical Microbiology and Infectious Diseases, Hadassah Hebrew University Medical Center, Jerusalem, Israel. [2] Clalit Health Services, Jerusalem district, affiliated with the Hebrew University, Jerusalem, Israel

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Corresponding author: Dr. Yonatan Oster, Department of Clinical Microbiology and Infectious Diseases, Hadassah-Hebrew University Medical Center, Ein Kerem, POB 12000, Jerusalem 91120, Israel. Phone: +972-2-6776543; Mail: yonatano@hadassah.org.il; Twitter handle: @rannirpaz1

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Highlight:

In a COVID-19 outbreak in a group of 25 twice-vaccinated Israeli travelers, the attack rate was 84%, despite negative pre-flight PCR tests. This extremely high breakthrough infection rate is attributed mainly to close and prolonged exposures during long bus-drives. Masking, distancing, and personal responsibility are required to avoid such outbreaks.

Since the spread of SARS-CoV-2 between continents and countries occurred mainly by international travel, banning and reducing air travel was an intervention used by many countries in an attempt to mitigate transmission. [1] Mass vaccination against the SARS-CoV-2 which began at the end of 2020, had substantially lowered the infection rate worldwide [2]. Following the vaccination program, international travel began to recover, with some restrictions, such as PCR testing before flights and masking regulations. Vaccinated travelers had a sense of security that they will not become infected during their travel. Israel was one of the first countries to apply nationwide successful vaccination program. This was followed be a steep decline in the infection incidence rate, [3]and an increase in the number of outgoing Israeli tourists. During June 2021, as in other countries, a 4th wave of the COVID-19 began in Israel, caused mainly by the Delta variant. Though outbreaks during travels were reported, [4] data is lacking regarding infection risk among vaccinated tourist groups. Here we describe an outbreak of COVID-19 among a group of vaccinated Israeli

tourists during an organized tour, the exposure and the attack rate. Data collection was approved by the Hadassah Medical Center Ethics Committee (HMO-0582-21).

On August 3rd, an organized group of 25 travelers departed from Tel-Aviv to Reykjavik (with a four hours connection in Vienna) for a 12-day tour in Iceland. All were vaccinated by two doses of the Pfizer BNT162b2 vaccine (24/25, 96% during January 2021). According with the Israeli regulations, all were tested within 72 hours prior to departure by a PCR for SARS-CoV-2 on nasopharyngeal swab and found negative. In Reykjavik they met the local bus driver (which was vaccinated as well) and used a dedicated bus throughout the entire tour. The tour was characterized by long bus drives (up to eight hours at a time), mostly with closed windows due to the low temperatures outside. During these rides the travelers were instructed to wear disposable face masks, with partial compliance. The group had only few indoor contacts with locals or other travelers. On August 13th (the 10th day of the tour), prior to their return flight, a PCR test was performed to all travelers. Surprisingly, 15 out of the 25 (60%) were found to be SARS-CoV-2 positive and were requested to stay in isolation for 10 days in Reykjavik, prior to flying home. The 10 negative travelers returned to Israel, however upon landing six of them tested positive. The four non-infected travelers were quarantined for seven days with a negative PCR testing on the 7th day. Overall, the attack rate of COVID-19 in this group was 84% (21/25). The single traveler that was vaccinated only a month prior to the trip, was also infected. Other characteristics of the infected and the non-infected travelers are presented in the appendix Table. The driver was asymptomatic throughout the trip, but data regarding PCR results is not available. Epidemiological questioning revealed that several of the infected travelers had mild respiratory symptoms, some also with

low grade fever, between the 6th and 10th day of the trip. The demographic and clinical characteristics of the group members are presented in the table. The median age (IQR) was 63 (59-67), the travelers had only few comorbidities and none had a known immunosuppression. All the infected persons had a mild course of disease and none were hospitalized. Unfortunately, the positive specimens were not available for sequencing of the viral Spike mRNA, thus the variant involved in this outbreak is unknown. Due to the fact that several travelers were already symptomatic during the trip, we assume that despite the negative PCR test prior the flight to Iceland, one of the travelers acquired the disease already in Israel and was the source of the outbreak. Yet, there was an increase in the incidence rate of COVID-19 in Iceland since mid-July 2021, thus it is also possible that the infection was acquired during the trip.

The presented outbreak demonstrates that prolonged exposure during travel poses a very high risk for infection, even among vaccinated persons; during a 12-day travel, the attack rate was 84%. This very high breakthrough infection rate might be explained by several factors. First, close and prolonged exposure probably increases the chance that the virus will evade the host immune system, as was described in influenza outbreaks. [5] Second, the effectiveness of the vaccine against infection by the Delta variant is known to be reduced compared to previous variants. [6] Lastly, it may be related to reduced vaccine effectiveness over time, as most of these travelers (24/25, 96%) had completed the 2-dose regimen more than six months before the trip. [7] Yet, an increased risk of infection was found among household contacts, even when the common circulating variant was Alpha and also within a short time following the 2-dose regimen. [8] This was explained by the intensive and

prolonged exposure, similar to the current outbreak, which, in our opinion, makes this factor the most significant. It is worth noting that on February 2020, long before vaccinations, during a long flight from Japan to Israel, carrying COVID-19 patients together with non-infected, no passenger became infected. [9] Probably the much shorter length of exposure and the more prudent use of masks during that flight, lowered the risk of infection. Despite the high rate of infection in the present trip to Iceland, all infected travelers had only mild illness. This probably resulted from the effectiveness of the vaccine in preventing severe COVID-19.

A pre-departure negative PCR test cannot rule out infection in its incubation period, [10] especially when travelling in a large group. In addition, it is challenging to maintain the basic rules of COVID-19 prevention (i.e. masking, social distancing and not crowding indoors) during group travel. Repeated testing for SARS-CoV-2 during a trip by rapid antigen test may be an option, but it depends on the personal will of each traveler. Needless to say, appearance of typical symptoms even if mild, requires personal responsibility for immediate isolation and PCR testing. Such a behavior might prevent an extensive outbreak.

When planning a trip during the ongoing COVID-19 pandemic, prudent travelers should consider these risks and use the recommended protective measures (e.g. masking, vaccination, avoiding crowding, travel with a small group etc.) in order to avoid infection.

Author statements

Author contributions:

Initiation - SB

Data Collection - MO

Data Analysis - YO, MC, SB

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Table: Characteristics of 25 travelers, vaccinated by two doses of the Pfizer BNT162b2 vaccine	
	N (%)
Baseline characteristics	
Age (median (IQR))	63 (59-67)
Female gender	13 (52)
Medical history	
Diabetes mellitus	8 (32)
Hypertension/Ischemic heart disease	8 (32)
Overweight	5 (20)
Immunosuppression	0 (0)
Past COVID-19 (recovered person)	0 (0)
2-dose Vaccination, 6 months prior the trip*	24 (96)
Negative PCR test for SARS-CoV-2 within 72 hours before the trip	25 (100)
Clinical course	
Positive PCR test for SARS-CoV-2 at the end of the trip	21 (84)
Symptoms (out of the 21 positive travelers) #	
Fever	11 (52)
Cough	13 (62)
Loss of taste/smell	5 (24)
Coryza	3 (14)
Sore throat	1 (5)
Shortness of breath	1 (5)
Asymptomatic	2 (10)
Hospital admission &	0 (0)

*One traveler received the second dose one month before the trip (was infected); another traveler received a third dose one day before the flight (was not infected)

Nine travelers (43%) began to have mild symptoms during the trip, between the 6th and 10th day of the trip

& One person was repatriated to Israel on a medical evacuation flight, but was not hospitalized