

SARS-CoV-2 Infection Rates in Arriving Air Travelers in Qatar

Short title: SARS-CoV-2 in airline travelers

Adeel A. Butt, MBBS, MS;^{1,2} Anas M. Al-Halabi, MBA;^{1*} Hafedh Ghazouani, MSc;¹ Mohamed Ben Haj Rhouma, PhD;⁴ Houssein H. Ayoub, PhD;⁴ Naseer A. Masoodi, MBBS, MBA;¹ Abdelsalam M. Borham, MQM;¹ Ahmed A. Hommos, MQM;¹ Roberto Bertolini, MD, MPH;³ Hiam Chemaitelly, MSc;² Laith J. Abu Raddad, PhD;² Abdul-Badi Abou-Samra, MD, PhD^{1,2}*

* AAB and AMA contributed equally to the paper.

Affiliations:

¹ Hamad Medical Corporation, Doha, Qatar

² Weill Cornell Medicine–Qatar, Doha, Qatar

³ Ministry of Public Health Qatar, Doha, Qatar

⁴ Department of Mathematics, Statistics, and Physics, Qatar University, Doha, Qatar

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Address all correspondence to:

Adeel A. Butt, MBBS, MS, FACP, FIDSA

Hamad Medical Corporation

PO Box 3050

Doha, Qatar

E-mail: aabutt@hamad.qa

Twitter: @adeelbutt_MD

Author Contributions:

Drafting of the manuscript: AAB; HG; MBHR;

Data acquisition: AMA; NAM; AMB; AAH; AA;

Study design: AAB; AMA; HG; HHA; LJA; AA;

Data analysis: AAB; HG; MBHR; HHA;

Data interpretation: AAB; HG; MBHR; HHA; LJA; AA;

Critical appraisal and review: AAB; AMA; HG; MBHR; HHA; NAM; AMB; AAH; RB; HC; LJA; AA;

Final approval: AAB; AMA; HG; MBHR; HHA; NAM; AMB; AAH; RB; HC; LJA; AA;

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Highlight

Among 352,174 airline travelers entering Qatar, 8,236 (2.34%) tested positive on or within the first seven days of arrival, with 3,789 (1.08%) testing positive at the time of arrival and the remaining 4,447 (1.26%) testing negative at arrival but positive 1 week later.

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In response to the SARS-CoV-2 pandemic and the potential of spread via air travel, many airlines instituted measures to reduce the risk of in-flight transmission. These include mandatory use of face masks, frequent disinfection of the aircraft, encouraging use of hand sanitizers, and pre-flight screening.¹ Despite the high potential of spread of SARS-CoV-2 prior to boarding and during flight, little data are available to determine the risk of returning travelers introducing infection in the destination country. Qatar is home to Hamad International Airport, one of the busiest global travel hubs in the world. First case of SARS-CoV-2 infection in Qatar was detected on February 27, 2020 in a returning traveler. Soon thereafter, several infection control and public health measures were implemented in Qatar and by Qatar Airways, the national carrier of Qatar. We undertook this study to determine the proportion of travelers infected with SARS-CoV-2 infection from various destinations who arrived between August 5, 2020, and February 22, 2021. During this period, travel to Qatar was restricted to Qatari nationals and long-term residents who were returning home.

All arriving travelers underwent a medical evaluation at the airport and underwent a nasopharyngeal swab for RT-PCR for SARS-CoV-2 infection and then placed in quarantine. Repeat testing was performed one week after arrival and those who tested negative on both occasions were released from quarantine. Those with a positive test were immediately transferred to a designated isolation facility or a hospital depending on the presence and severity of symptoms. The port of last embarkation was confirmed for all arriving travelers at the time of baseline evaluation from the airline's boarding pass. Nationality was determined by the Qatar national identification card used at the immigration to gain entry. We determined the proportion of arriving travelers to Qatar who were SARS-CoV-2 positive by RT-PCR on a nasopharyngeal swab. For those with multiple entries into the country, all visits were included unless they tested positive, at which point they were censored.

Between August 5, 2020, and February 22, 2021, a total of 352,174 travelers entered Qatar. Of those, 8,236 (2.34%) persons tested positive on or within the first seven days of arrival, with 3,789 (1.08%) testing positive at the time of arrival and the remaining 4,447 (1.26%) testing negative at arrival but positive 1 week later. The remaining 343,938 persons tested negative on both occasions. The median age of those who tested positive was 31 (IQR 22,38) years compared with 33 (IQR 24,42) years for those who tested negative. Approximately 30% in each group were females and 15% were Qatari nationals. **(Table 1)** The top five ports of last embarkation were in India, Turkey, Pakistan, the United Kingdom and Nepal. Among those who eventually tested positive, 17.0% were symptomatic while among those who remained test-negative, only 1.8% had symptoms suggestive of an upper respiratory tract infection. **(Table 1)**

The proportion of returning travelers with a positive PCR was higher among those <40 years old compared to those ≥ 40 years (5.1% vs. 1.1%; $p < 0.001$). The proportion was also higher among those with symptoms compared with asymptomatic persons (18.7% vs. 2.0%, $p < 0.001$). The PCR positivity was highest among those coming from Latin or South America followed by Africa and North America. **(Table 1)**

Based on the incubation period of SARS-CoV-2, it is likely that those testing positive at arrival were exposed to infection before embarkation on the arriving flight. Those testing negative at arrival but positive one week later may have been exposed during or after arrival. While this indicates a relatively low risk of infection attributable to the travel itself, it still represents a significant risk for new infections to enter through travel into community transmission. Previous studies of infection among airline passengers have indicated a 2-6% prevalence of infection, with nearly half of those being asymptomatic.^{2,3} Transmission rates have been lower when strict masking and physical distancing were observed.^{4,5} Our study results are consistent with these

previous studies, with strict use of masks, reduced capacity on airplanes, and meticulous cleaning and disinfecting practices likely to have resulted in positivity rate at the lower end of that spectrum.

Certain factors can mitigate the impact of travel upon imported cases. Foremost among them is presence of natural or vaccine induced immunity in travelers before embarking on the journey. A recent study from Qatar demonstrated that the proportion of persons with a positive PCR after arrival was 3.74-3.82% among those with no record of vaccination or natural infection, while it was 0.82% among those with full vaccination and 1.01% among those with evidence of prior natural infection ≥ 90 days prior to arrival.⁶

Strengths of our study include robust data collection and SARS-CoV-2 testing at the single port of entry into Qatar via Hamad International Airport. All quarantine sites were managed by Hamad Medical Corporation, the single largest provider of healthcare in Qatar, thereby making tracking patients and data collection uniform across all sites. Limitations include lack of data on recent variants of concern and their impact on the local epidemic curve. Particularly, the Delta variant has been associated with higher rates of transmission. However, the Delta variant was in community transmission in Qatar only starting from the end of March, 2021, after the end of the observation period for this study.^{7,8} We did not study clinical outcomes in travelers with a positive test. It is also possible that some travelers may not have strictly adhered to the quarantine measures, particularly among those who were allowed to self-quarantine at home. Finally, some may have had infection with an incubation period >7 days.

Table 1. Proportion of travelers with a positive SARS-CoV-2 test after arrival.

| Variables | Total passengers | | No positive SARS-CoV-2 PCR | | At least one positive SARS-CoV-2 PCR | | % positive | P-value |
|--|-------------------------|----------|-----------------------------------|----------|---|----------|-------------------|----------------|
| | n=352,174 | | n=343,938 | | n =8,236 | | | |
| | Count | % | Count | % | Count | % | | |
| Age | | | | | | | | |
| Median (IQR), years | 33 (24-42) | | 33 (24-42) | | 31 (22-38) | | | <0.0001 |
| <40 years | 109,392 | 31.06% | 103,814 | 30.49% | 5,578 | 67.73% | 5.10% | |
| ≥ 40 years | 242,782 | 68.94% | 240,124 | 70.53% | 2,658 | 32.27% | 1.09% | |
| Sex | | | | | | | | |
| Female | 103,980 | 29.53% | 101,465 | 29.80% | 2,515 | 30.54% | 2.42% | 0.04 |
| Male | 248,194 | 70.47% | 242,473 | 71.22% | 5,721 | 69.46% | 2.31% | |
| Nationality, (%) | | | | | | | | |
| Qatari | 52,759 | 14.98% | 51,517 | 14.98% | 1,242 | 15.08% | 2.35% | <0.0001 |
| Non-Qatari | 299,415 | 85.02% | 292,421 | 85.02% | 6,994 | 84.92% | 2.34% | |
| Symptomatic* | 7,489 | 2.12% | 6,089 | 1.77% | 1,400 | 17.00% | 18.69% | <0.0001 |
| Country of Origin (top ten) | | | | | | | | |
| India | 84,247 | 23.92% | 82,123 | 23.88% | 2,123 | 25.78% | 2.52% | 0.03 |
| Turkey | 39,499 | 11.22% | 38,351 | 11.15% | 1,148 | 13.94% | 2.91% | |
| Pakistan | 22,201 | 6.30% | 21,671 | 6.30% | 530 | 6.44% | 2.39% | |
| United Kingdom | 22,049 | 6.26% | 21,547 | 6.26% | 502 | 6.09% | 2.28% | |
| Nepal | 12,343 | 3.50% | 11,872 | 3.45% | 471 | 5.72% | 3.82% | |
| Egypt | 11,871 | 3.37% | 11,578 | 3.37% | 293 | 3.56% | 2.47% | |
| Philippines | 10,687 | 3.03% | 10,464 | 3.04% | 222 | 2.70% | 2.08% | |
| Sudan | 10,085 | 2.86% | 9,681 | 2.81% | 404 | 4.91% | 4.01% | |
| Kuwait | 9,837 | 2.79% | 9,761 | 2.84% | 77 | 0.93% | 0.78% | |
| Lebanon | 9,756 | 2.77% | 9,486 | 2.76% | 270 | 3.27% | 2.77% | |
| Others | 119,599 | 33.96% | 117,403 | 34.13% | 2,196 | 26.66% | 1.84% | |
| Region of Origin (geographical) | | | | | | | | <0.001 |
| Asia & Pacific | 73,533 | 20.9% | 72,074 | 21.00% | 1,459 | 17.7% | 1.98% | |
| Africa | 32,416 | 9.20% | 31,232 | 9.10% | 1,184 | 14.4% | 3.65% | |
| South/Latin America | 1,817 | 0.50% | 1,665 | 0.40% | 152 | 3.4% | 8.37% | |
| Gulf region | 57,755 | 16.40% | 56,571 | 16.50% | 1,184 | 12.8% | 2.05% | |
| North America | 13,961 | 4.00% | 13,454 | 3.90% | 507 | 6.2% | 3.63% | |
| Europe | 172,692 | 49.00% | 168,942 | 49.10% | 3,750 | 45.5% | 2.17% | |

* Symptoms compatible with upper respiratory tract infection.

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