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## Original Research

# Airport Personnel and Coronavirus Disease-2019: A Seroprevalence Study in Taiwan

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▌ ABSTRACT ▌

**Introduction**
Many countries tried to lifted the travel restriction to revive their stagnant tourism-based economies. However, infection risks among airport personnel are incompletely understood. We therefore conducted this seroepidemiological study targeting airport personnel.

**Methods**
This cross-sectional study was conducted from October 20th, 2020 to February 28th, 2021 at the Taoyuan International Airport in Taiwan. All adults who worked at Taoyuan International Airport and were older than 20-years of age were eligible for participation. Serological tests were collected and study participants were asked to complete an online questionnaire which collected self-reported data including demographic characteristics, occupation, exposure risk assessment, recent symptoms, and self-perceived risk of infection with severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). Continuous data were expressed with median and interquartile ranges; categorical data were expressed with counts and proportions.

**Results**
A total of 450 volunteers agreed to participate in the study. Most of the participants worked as ground crew (40.7%). Approximately 43.6% of participants did not feel any symptoms in the 3-months prior to serologic testing. Only 8 participants (1.8%) reported close contact with confirmed coronavirus disease-2019 (COVID-19) cases. Overall, none of the study participants had serologic confirmation of immunoglobulin G (IgG) antibodies against SARS-CoV-2.

**Conclusion**
The SARS-CoV-2 infection rate among airport personnel was low. This study demonstrates that a well-designed border control strategy may work and so that transmission of SARS-CoV-2 may be controllable.

**Keywords**
COVID-19; Seroprevalence; Travel; Airport; Workers.

## INTRODUCTION

Since the beginning of the coronavirus disease-2019 (COVID-19) pandemic in 2020,[1] international air travel has been restricted to curb the exponential growth in viral transmission. While this strategy was successful in many ways, it also caused unprecedented global financial losses with particularly detrimental costs to international trade and tourism markets.[2] Encouraged by lower rates of transmission from over 1-year of travel restrictions coupled with developing robust vaccination efforts, many countries have gradually lifted travel restrictions and have created "travel bubbles" establishing temporary travel agreements between countries in an attempt to revive their stagnant tourism-based economies. However, these agreements may be premature and should

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be carefully evaluated before governmental approval given the on-going high-risk associated with cross-border importation of CO-VID-19 cases and subsequent outbreaks.

Taiwan is one of the countries with the lowest incidence and mortality rates of COVID-19 in the world. As of April 23rd, 2021, there have been 1090 confirmed cases of COVID-19 in Taiwan, of which only 78 (7.2%) were acquired domestically.[3] Since most COVID-19 cases were imported through air flight, the Taiwanese government established strict border control screenings at airports to identify infectious travellers with active COVID-19 infection. Preventive measures developed to identify potentially infectious travellers included temperature screening, a compulsory questionnaire regarding travel and contact history, compulsory COVID-19 nasopharyngeal testing prior to boarding, compulsory post-entry quarantine for 14-days, post-entry surveillance and tracking *via* global positioning system (GPS), and mandatory confirmation of disease-free status after quarantine.

Despite Taiwan's success in COVID-19 containment,[4] airport personnel remained one of the groups at highest risk of contracting COVID-19 due to their constant exposure to potentially-infected travellers. To the best of our knowledge, airport personnel's occupational exposure risk relating to COVID-19 travellers has only been assessed in one study conducted at an airport in Bogota, Colombia.[5] Among the 212 tested workers, the accumulated incidence rate of COVID-19 was 23.6%.[5] The risk of contracting COVID-19 may not only be caused by occupational exposure since the prevalence rates of COVID-19 were similarly high among the general public.

Due to the low COVID-19 disease prevalence, Taiwan is one of the countries considering implementation of travel bubble agreements. However, infection risks among airport personnel are incompletely understood. Accurate assessment of infection risks among airport personnel is essential to inform the ongoing border control strategies to prevent COVID-19 transmission among airport personnel and travellers. We therefore conducted this seroepidemiological study targeting airport personnel.

## METHODS

This cross-sectional study was approved by the institutional review board (reference number: 202008005RIPA) and written inform consent was complete before enrolling volunteers. This study was conducted from October 20th, 2020 to February 28th, 2021 at the Taoyuan International Airport in Taiwan. Taoyuan International Airport is the largest international airport in Taiwan with an average of 47,419 inbound passengers per month during the study period. During the pandemic, several measures were adopted to prevent transmission of COVID-19 by international flight, including body temperature screening, face mask mandates, and social distancing requirements. International passengers were required to present COVID-19-free documentation prior to boarding. Furthermore, flight crews were isolated from other airport personnel and were required to quarantine at home for a certain period after an international flight.

All adults who worked at Taoyuan International Airport and were older than 20-years of age were eligible for participation. Personnel who had been diagnosed with COVID-19 previously were excluded. Vaccination for severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) was not yet available in Taiwan during the study period. Study information was promoted through social media services and the information was distributed at the medical clinic in the airport. After completion of informed consent, serological tests were collected and study participants were asked to complete an online questionnaire. The SARS-CoV-2 immunoglobulin G (IgG) antibody assay (Abbott Laboratories, Abbott Park, Illinois, USA) was performed by commercial kit according to the manufacturer's instructions. The online questionnaire collected self-reported data including demographic characteristics, occupation, exposure risk assessment, recent symptoms, and self-perceived risk of infection with SARS-CoV-2. Since the first clustered cases of COVID-19 were identified in Wuhan, China during December of 2019,[1] international travel history included any travel that occurred during or after October 2019 that could result in COVID-19 seropositivity for up to several months after exposure.[6] Continuous data were expressed with median and interquartile ranges; categorical data were expressed with counts and proportions.

## RESULTS

A total of 450 volunteers agreed to participate in the study. The median age of participants was 32-years-old and 38.4% of the participants were males. Most of the participants worked as ground crew (40.7%), followed by aviation police (15.6%) and quarantine officers (11.8%). Approximately 36.9% of participants travelled internationally after October 2019, with Japan being the most visited country (11.6%). International travel rates decreased to 2.4% for the study participants during the 3-months prior to their serologic testing. Only 8 participants (1.8%) reported close contact with confirmed COVID-19 cases. Approximately 43.6% of participants did not feel any symptoms in the 3-months prior to serologic testing. There were no participants reporting symptoms of anosmia or ageusia. If the likelihood of contracting COVID-19 was assumed to be 100% given participants close contact with confirmed COVID-19 cases over an extended timeframe without appropriate personal protection equipment, the median self-perceived risk of infection with SARS-CoV-2 was reported to be 30% (Table 1). Overall, none of the study participants had serologic confirmation of IgG antibodies against SARS-CoV-2.

## DISCUSSION AND CONCLUSION

Since most COVID-19 cases were imported from abroad in Taiwan, the airport was viewed as one of the most probable places COVID-19 may be transmitted from travellers with confirmed infections or from individuals travelling during their asymptomatic incubation period. This study of airport personnel demonstrates a 0% COVID-19 infection rate, which suggested that when appropriate infection control measures were employed, transmission at an airport may be controllable. This conclusion may be informative for similar countries with low COVID-19 prevalence rates considering establishment of travel bubbles.

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| **Table 1.** *Characteristics and Questionnaire Results of Participants* | |
|---|---|
| **Characteristic** | **Participants (n=450)** |
| Age, years, median (interquartile range) | 32 (28-41) |
| Male, n (%) | 171 (38.4) |
| **Occupation, n (%)** | |
| Ground crew | 183 (40.7) |
| Aviation police | 70 (15.6) |
| Quarantine officer | 53 (11.8) |
| Airport Services | 22 (4.9) |
| Airport medical staff | 21 (4.7) |
| Airport shops workers | 19 (4.2) |
| Immigration agency | 14 (3.1) |
| Flight crew | 13 (2.8) |
| Tourism | 10 (2.2) |
| Airline workers | 5 (1.1) |
| Customs | 2 (0.4) |
| Transportation | 1 (0.2) |
| Airport catering | 1 (0.2) |
| Others | 36 (8) |
| **Assessment of potential exposure to COVID-19, n (%)** | |
| International travel within recent 3-months | 11 (2.4) |
| International travel after October 2019 | 166 (36.9) |
| Most often visited countries after October 2019 | Japan, 52 (11.6) |
| Close contact with confirmed COVID-19 cases | 8 (1.8) |
| **Symptoms within recent 3-months before serologic testing, n (%)** | |
| Rhinorrhoea | 97 (21.6) |
| Cough | 59 (13.1) |
| Sore throat | 56 (12.4) |
| Diarrhoea | 32 (7.1) |
| Fever | 9 (2) |
| Anosmia | 0 (0) |
| Ageusia | 0 (0) |
| No symptoms | 196 (43.6) |
| Self-perceived risk of infection with SARS-CoV-2, percentage, median (interquartile range) | 30 (10-50) |

Among the participants, despite that some of them had international travel experience after October 2019 or the close contact with confirmed COVID-19 cases, the seroconversion rate was still 0%. Additionally, since we did not detect any infections and our airport personnel all lived within the greater Taipei community, our result also suggests that the risk of community infection with SARS-CoV-2 remains low in Taiwan without evidence of substantial underreporting of COVID-19 cases.[7]

## LIMITATIONS

There are some limitations in our study. First, those volunteered to participate may have had different risk factors and infection rates compared to those who did not participate in the study. In Taiwan, if COVID-19 was diagnosed, the patient would likely be either hospitalized or quarantined for a certain period, making it much less likely that they would be in the airport during the study period. Although the positivity of SARS-CoV-2 IgG antibody only sug-

gested infection in the past, some personnel may have been less willing to participate due to concerns that if they tested positive, they may have to be quarantine and even lose jobs. Second, we only tested SARS-CoV-2 IgG antibody one time without subsequent follow-up or repeat testing. Therefore, some newly infected participants may have had negative COVID-19 IgG antibody results that underestimated true infection rates. Finally, only thirteen flight crew were recruited and the proportion seemed low in our cohort. Therefore, our results may not be representative of this population with assumably highest risk of contracting COVID-19.

The SARS-CoV-2 infection rate among airport personnel was low. Based on our study, there is no evidence that airport personnel have a high prevalence of COVID-19.

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## INSTITUTIONAL REVIEW BOARD PERMISSION

This cross-sectional study was approved by the institutional review board with reference number: 202008005RIPA.

## CONSENT

The authors have received written informed consent from the patient.

## CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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