Journal of Clinical Virology 67 (2015) 8–13

Contents lists available at ScienceDirect

Journal of Clinical Virology

journal homepage: www.elsevier.com/locate/jcv

Respiratory viruses in airline travellers with influenza symptoms: Results of an airport screening study

Lance C. Jennings[a,*], Patricia C. Priest[b], Rebecca A. Psutka[b,1], Alasdair R. Duncan[c], Trevor Anderson[d], Patalee Mahagamasekera[d], Andrew Strathdee[d], Michael G. Baker[e]

[a] Virology Section, Canterbury Health Laboratories, and Pathology Department, University of Otago, Christchurch 8011, New Zealand
[b] Department of Preventive and Social Medicine, University of Otago, Dunedin 9054, New Zealand
[c] Planning and Funding, Canterbury District Health, Christchurch 8011, New Zealand
[d] Virology Section, Canterbury Health Laboratories, Christchurch 8011, New Zealand
[e] Department of Public Health, University of Otago, Wellington 6242, New Zealand

ARTICLE INFO

Article history:
Received 2 December 2014
Received in revised form 8 March 2015
Accepted 12 March 2015

Keywords:
Respiratory viruses
Screening
Rhinovirus
Enterovirus
Influenza

ABSTRACT

Background: There is very little known about the prevalence and distribution of respiratory viruses, other than influenza, in international air travellers and whether symptom screening would aid in the prediction of which travellers are more likely to be infected with specific respiratory viruses.
Objectives: In this study, we investigate whether, the use of a respiratory symptom screening tool at the border would aid in predicting which travellers are more likely to be infected with specific respiratory viruses.
Study design: Data were collected from travellers arriving at Christchurch International Airport, New Zealand, during the winter 2008, via a symptom questionnaire, temperature testing, and respiratory sampling.
Results: Respiratory viruses were detected in 342 (26.0%) of 1313 samples obtained from 2714 symptomatic travellers. The most frequently identified viruses were rhinoviruses (128), enteroviruses (77) and influenza B (48). The most frequently reported symptoms were stuffy or runny nose (60%), cough (47%), sore throat (27%) and sneezing (24%). Influenza B infections were associated with the highest number of symptoms (mean of 3.4) followed by rhinoviruses (mean of 2.2) and enteroviruses (mean of 1.9). The positive predictive value (PPV) of any symptom for any respiratory virus infection was low at 26%.
Conclusions: The high prevalence of respiratory virus infections caused by viruses other than influenza in this study, many with overlapping symptotology to influenza, has important implications for any screening strategies for the prediction of influenza in airline travellers.

1 Background

There is very little known about the prevalence and distribution of common respiratory viruses in air travellers.

The dissemination of novel human respiratory viruses by air travellers is well established. The introduction of SARS into Vietnam occurred by a businessman travelling by air from China through Hong Kong SAR [1]. Subsequent dissemination from Hong Kong to Singapore, Beijing, Germany, Canada and other countries by air travellers led to outbreaks of infection occurring [2,3]. Since, the first cases of MERS-CoV were reported in September 2012, limited transmission to European and other countries has occurred by international travelers returning from the Middle East [4].

The rapid global spread of the novel influenza A(H1N1) pdm09 virus after first being detected in Southern California in late April 2009 was also likely to have been via air travellers [5]. The first identification of the virus in New Zealand in April 2009 was in high school students returning by air from Mexico [6]. Similarly, studies on international travelers arriving in Australia in May 2009 [7] and on medical students returning to Spain in June 2009, demonstrated outbreaks among the study group and their contacts [8]. While, these and previous reports documenting seasonal influenza among air travelers [2,9–11] have focused primarily on the in-flight transmission of influenza, clearly air travellers are responsible for

* Corresponding author. Tel.: +64 3 364 0075; fax: +64 3 364 0750.
E-mail address: lance.jennings@cdhb.health.nz (L.C. Jennings).
[1] Current address: Faculty of Medicine, Health Sciences Centre, Foothills Campus, University of Calgary, Calgary, Alberta T2N 4N1, Canada.

http://dx.doi.org/10.1016/j.jcv.2015.03.011
1386-6532/

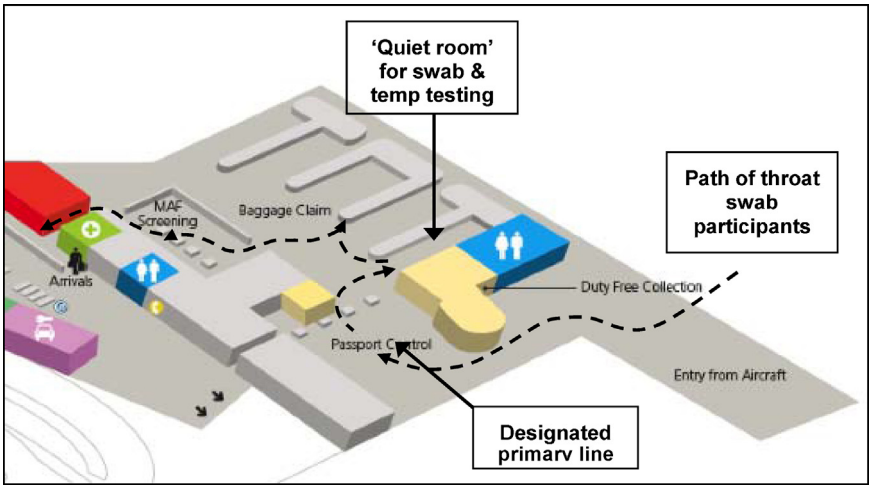

Fig. 1. Organisation of traveller screening at the study airport.

the introduction of influenza viruses into countries on an ongoing basis [12].

There are few reports of the dissemination of other respiratory viruses by air travellers. A mixed outbreak of parainfluenza type 1 and influenza B viruses was reported among tourists returning to the United States [13], while an investigation of travelers by Follin et al. reported the identification of rhinovirus, coronavirus, influenza A and B, parainfluenza virus, adenovirus, metapneumovirus and enterovirus in passengers with influenza-like illness (ILI) [14]. With the emergence of the MERS-CoV, possible introduction by Hajj pilgrims with a high rate of respiratory symptoms returning to France have been investigated with no cases identified [15].

In a 2008 study, we sought to assess the prevalence of influenza infection in symptomatic and asymptomatic arriving international airline travellers and whether using a symptom-screening questionnaire and temperature measurement could reliably predict seasonal influenza infection [16]. We tested symptomatic travellers for a range of other respiratory viruses and asked them to report their symptoms.

2. Objectives

In this study, we describe the spectrum of symptoms associated with infection with respiratory viruses in arriving airline travellers. We ascertain whether, the use of symptom screening at the border would aid in predicting which travellers are more likely to be infected with specific respiratory viruses.

3. Study design

This assessment of the prevalence of other respiratory virus infections in arriving airline travellers was carried out at Christchurch International Airport, New Zealand, from 23 June to 12 September 2008.

A questionnaire on basic demographics and symptoms was distributed on board three airlines' flights from Australia to Christchurch, New Zealand [17].

3.1. Participants

All symptomatic travellers (defined as those reporting at least one of cough, sore throat, sneezing, fever or chills, runny or blocked nose, muscle aches or pains, feeling generally unwell, chest discomfort or breathing difficulties) who completed the questionnaire were identified as they arrived at the airport and went through immigration (Fig. 1), and following informed consent, were asked to provide a nose and throat swab and have their temperature measured. This paper reports on specimen results from these symptomatic travelers.

3.2. Respiratory specimens

All combined throat and nasal swab samples (Copan, Italy) were analysed at Canterbury Health Laboratories, Christchurch, New Zealand. Influenza A and B viruses were tested using a commercial Easyplex® Multiplexed Tandem PCR (MT-PCR) as described by the manufacturer (Easyplex® Influenza A + B kit, Cat No. 3005.01, Ausdiagnostics, Sydney, Australia). The other respiratory viruses were tested using a similar commercial MT-PCR system (Easyplex, Respiratory Panel 12c, Cat No: 6062.1 AusDiagnostics, specifically manufactured for the study). Picornaviruses were confirmed as either rhinoviruses or enteroviruses using two in-house singleplex PCR assays [18–20].

3.3. Statistical analysis

Data were entered into Microsoft Excel and all statistical tests were conducted using Stata 11. Chi^2 tests were used to identify significant patterns in age or nationality by virus type. Influenza-like illness was defined as a measured fever $\geq$37.8 °C and either a cough or sore throat [21].

For each demographic characteristic and each symptom, the prevalence of infection with each virus among participants with that characteristic was calculated. This is equivalent to the positive predictive value (PPV) of that characteristic for that virus.

For participants infected with each virus, the number and proportion with each symptom and the mean number of symptoms were calculated to illustrate the pattern of symptoms associated with each virus.

Proportions and confidence intervals around means were calculated for groups with more than 10 participants.

4. Results

4.1. Study participants

Of 2714 symptomatic travellers, 49% agreed to provide a respiratory sample, 1331 respiratory samples were obtained, of which 1313 were valid and able to be tested for respiratory viruses.