

SPECIAL FEATURE: SEVERE ACUTE RESPIRATORY SYNDROME (SARS)

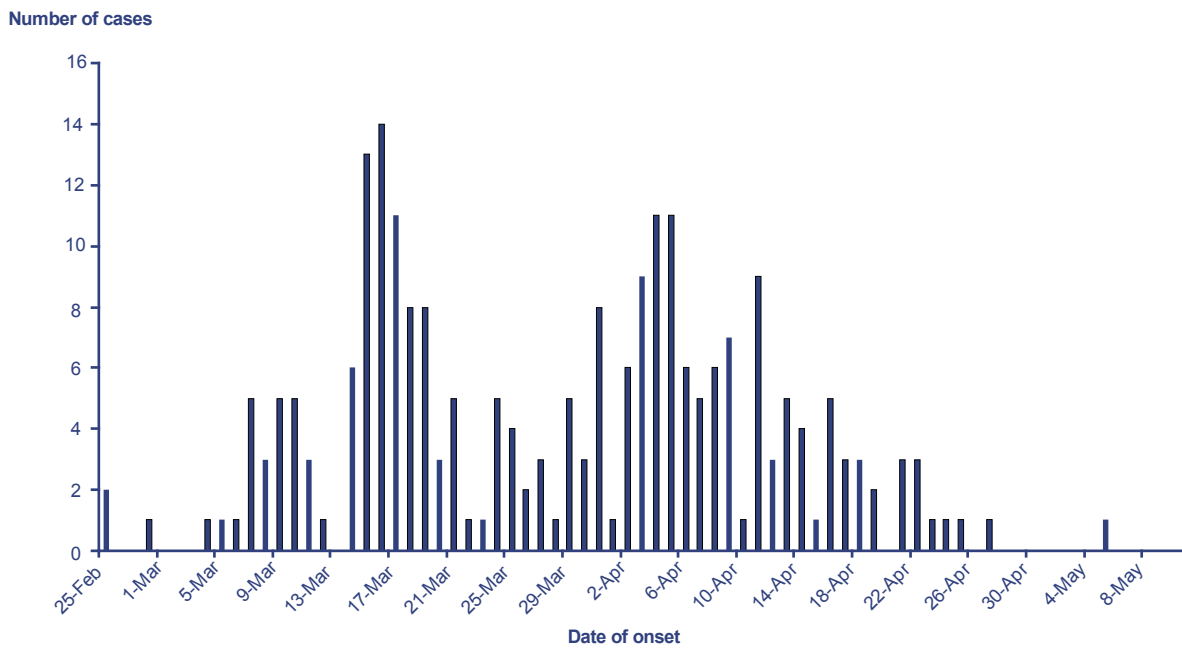
Severe Acute Respiratory Syndrome (SARS) was first recognised in the world on 26 February 2003 in Hanoi, Vietnam. At that time, the causative agent was unknown. The main signs and symptoms included high fever, cough, shortness of breath or breathing difficulties. A proportion of patients developed severe pneumonia progressing to respiratory distress requiring assisted ventilation.

On 12 March, the World Health Organization issued a global alert on outbreaks of a severe form of atypical pneumonia in Vietnam, Hong

Kong SAR and Guangdong China. This syndrome, eventually coined as SARS, was caused by a novel coronavirus. The rapid spread of the disease worldwide resulted in 8,096 cases and 774 deaths in about 30 regions, including China, Hong Kong SAR, Taiwan, Canada, Vietnam and Singapore.

In Singapore, a total of 238 probable SARS cases were reported between March and May 2003. The onset of illness of the first case was 25 February, while that of the last case was 5 May.

Epidemic curve of SARS cases, 2003



Altogether, there were eight imported cases. All except one were female. Of the probable SARS

cases, 41% were healthcare workers and 43% were family members, friends or social contacts of cases.

Probable SARS cases by nature of contact & gender

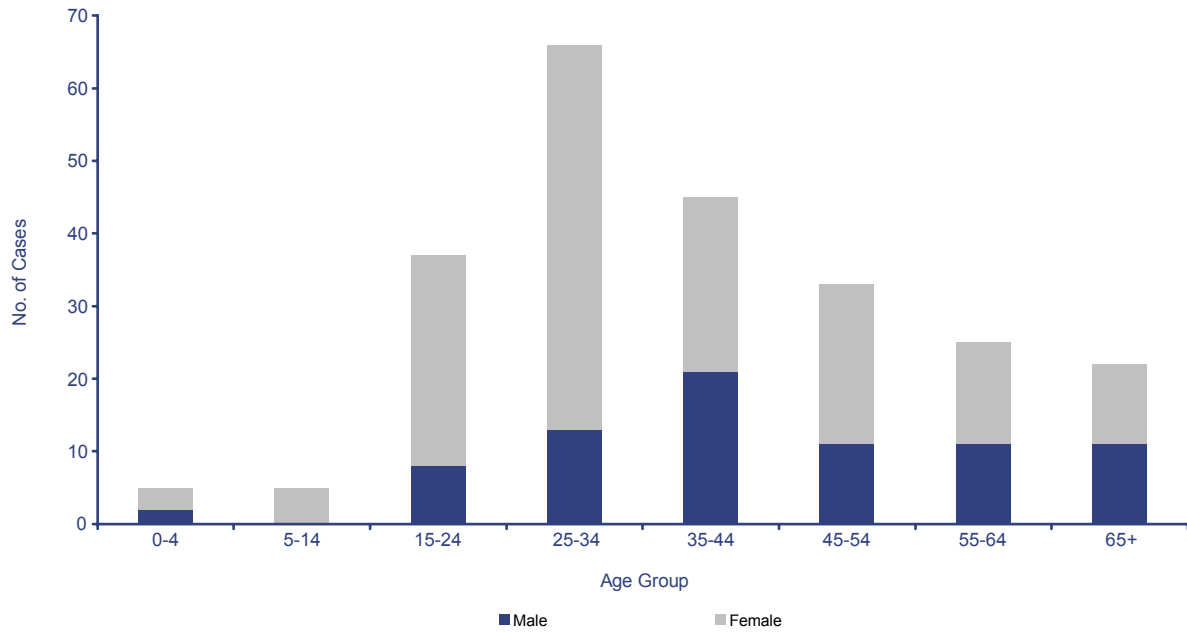
Nature of Contact	Male	Female	Total	
			No.	%
Index Case	1	7	8	3
Healthcare Worker	13	84	97	41
Family	23	31	54	23
Friend/Social	20	28	48	20
Inpatient	20	11	31	13
Total	77	161	238	100

The median age of the probable SARS cases was 35 years, with an age range of 1 to 90 years.

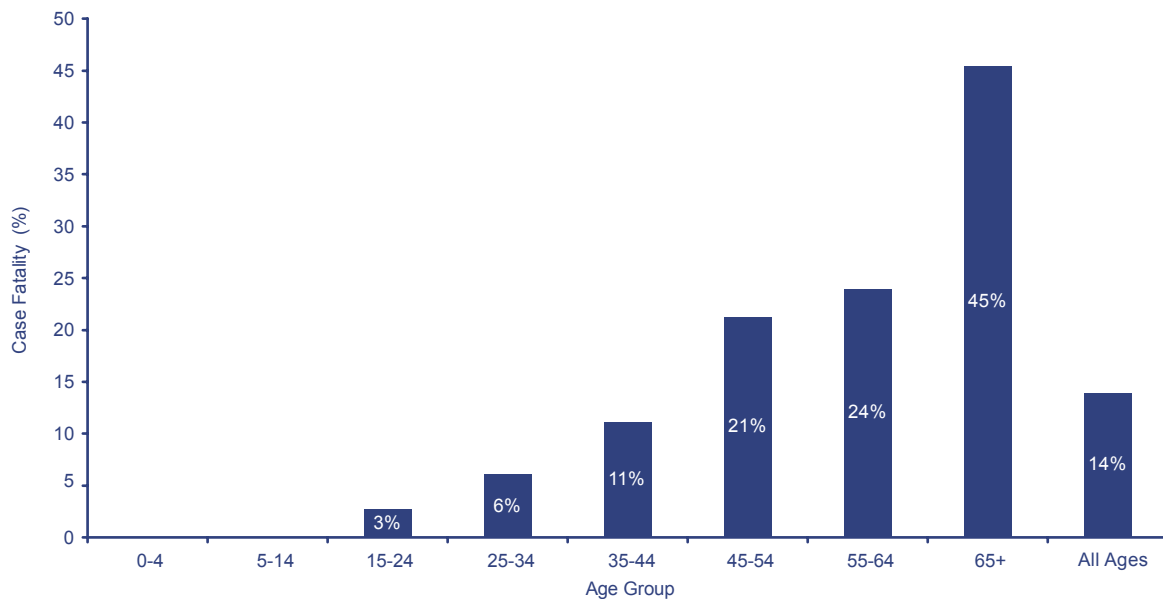
During the outbreak, 33 succumbed to the infection,

giving an overall case fatality rate of 14%. There was no death below the age of 15. Case fatality increased with age, with the highest (45%) occurring among those 65 years and above.

Age distribution of probable SARS cases (n=238)



Age specific case fatality (%) of SARS cases



SARS Outbreak in Singapore

The SARS outbreak in Singapore was detected in early March 2003 and sequentially involved three major acute hospitals and a wholesale centre. It was initiated by a 23-year-old traveller (Patient A) who had returned from a vacation in Hong Kong. On 1 March, she was admitted to Tan Tock Seng Hospital (TTSH) for treatment of atypical pneumonia. She was later diagnosed with SARS. She had stayed on the ninth floor of the Metropole Hotel in Hong Kong, where it was believed she became infected.

TTSH Cluster

During her admission in TTSH, Patient A infected 24 close contacts who subsequently developed SARS. Among them, a nurse infected by Patient A passed on the infection to another 25 people, one of whom was later transferred to the Coronary Care Unit for monitoring of her heart condition. This led to the infection of another 27 people. These three superspreading events contributed to the outbreak in TTSH, which resulted in a total of 109 probable SARS cases.

The outbreak later spread to two tertiary hospitals - the Singapore General Hospital (SGH) and National University Hospital (NUH).

SGH Cluster

On 24 March, a patient (Patient B) discharged from TTSH, who was a contact of Patient A, was admitted to SGH for treatment of gastrointestinal bleeding. With an atypical presentation of SARS, the patient remained undiagnosed and was nursed in a non-isolation ward until 2 April. This resulted in an outbreak of 60 cases in SGH.

Patient B's brother (Patient C), who visited him at SGH on 31 March, developed symptoms of SARS five days later and was admitted to NUH on 8 April.

NUH Cluster

During his hospitalisation, Patient C infected eight others. His contact history was not elicited at the beginning and he was nursed in a non-isolation ward. In addition, he also infected his wife and son.

PPWC Cluster

Patient C worked at Pasir Panjang wholesale centre (PPWC). He had continued to work, despite falling ill on 5 April. As a result, he sparked off a cluster of infection among co-workers at PPWC, including two taxi drivers who ferried him. One of Patient C's co-workers at PPWC then passed on the infection to his family members.

Public Health Measures

Singapore adopted a three-pronged strategy to manage the SARS outbreak:

1. Prevention and control in hospitals
2. Prevention and control in the community
3. Prevention of trans-border spread

Prevention and control in the hospitals included the following measures:

1. Centralisation of all SARS cases in 1 hospital (TTSH)
2. Restriction of movement of healthcare workers and patients across hospitals
3. Strict infection control procedures in all hospitals and healthcare institutions
4. Mandatory protective gear for all healthcare workers in hospitals
5. Close monitoring of all healthcare workers
6. Restrictions on visitors

Prevention and control measures instituted within the community included:

1. Intensive public education on SARS and importance of social responsibility
2. Issuance of travel and health advisories
3. Temperature taking, early detection of cases for isolation and treatment
4. Identification of close contacts by rigorous contact tracing
5. Mandatory home quarantine under the Infectious Disease Act

Preventive measures against trans-border spread included:

1. Health screening of passengers with thermal imaging scanners at airport, seaport and land checkpoints
2. Health declaration requirements for travellers
3. Health alert notices for travellers
4. Trans-border contact tracing on suspect and probable SARS cases
5. Close cooperation with WHO and other health authorities

Outbreak Over

As a result of the intensive public health measures instituted, the SARS outbreak in Singapore was contained within two months. On 31 May, Singapore was removed from the WHO list of areas with recent local SARS transmission. About a month later, on 5 July, WHO declared that SARS outbreaks had been contained worldwide.

Laboratory-acquired Case

On 8 September, a laboratory-confirmed case of SARS coronavirus infection emerged in Singapore. This was a 27-year-old researcher, who worked in a virology laboratory. He had presented with mild illness. However, due to the hospital's vigilance, SGH rapidly detected the case and implemented appropriate isolation and infection control measures. There was no further transmission.

As the source of his infection was suspected to be a workplace exposure in the laboratory, an 11-member international panel of experts was appointed to examine laboratory safety issues surrounding the case. The panel's investigation concluded that the researcher most likely acquired the infection in the laboratory as a result of accidental contamination. He was conducting research on the West Nile virus in a laboratory that had concurrent research activities using active SARS coronavirus. Investigations revealed that both viruses were detected in a research specimen. The genetic sequence of the SARS coronavirus isolated from the researcher was also closely related to the sequence of the laboratory strain. In addition, the panel identified several inappropriate laboratory practices that had contributed to the accident and made recommendations for correction.

This was the first laboratory-acquired SARS case in the world. In response to the incident, WHO reviewed and revised its biosafety guidelines for handling SARS coronavirus.