

SARS and It's Implications

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Abstract

SARS or Severe Acute Respiratory Syndrome is an atypical pneumonia, which spread over 31 countries of the world within a few months, infecting 8548 people and killing 807 people worldwide. Caused by the corona virus, which jumped the species barrier. SARS is the first major disease of the 21st Century, which took advantage of the closely connected and highly mobile society. The disease spread rapidly by air travel, but was quickly brought under control by efficient management and worldwide cooperation but not before it had serious social and economic impact. The present paper is an attempt to trace the diffusion of the disease and to examine the social and economic implication of the disease.

Introduction

Severe Acute Respiratory Syndrome or SARS is the first major new infectious disease of the 21st century, which has taken full advantage of the closely connected and the highly mobile society.

SARS is an atypical pneumonia, which spread across the world during the early part of 2003, infecting thousand and killing hundreds mostly in South East Asia. Unlike the earlier epidemics, (the bubonic plague which killed 25 million in Europe in the 14th Century or the Spanish flu of 1918 which killed 70 million or the AIDS pandemic which killed 12 million so far) which spread gradually, the SARS epidemic spread rapidly with air travel and created panic world wide, but was brought under control efficiently. The new disease of the 3rd millennium has had serious economic impact on the region as well. Within six weeks, the World Health Organization brought SARS to the world attention with an emergency alert, but it had already spread over thirty countries.

The Causative Agent

Atypical pneumonia is a viral infection, usually caused by virus like the influenza virus; *adeno* virus and other respiratory viruses. Organisms like the *legionella* bacteria may cause atypical pneumonia, also. Health experts have ruled out any association with influenza A and B viruses and the H5N1 bird flu virus, which jumped the species barrier and killed six people earlier in the year. The WHO narrowed down the virus to two, the *corona* virus and the *paramyxo* virus.

It was later confirmed by the US Center for Disease Control and Prevention that SARS is caused by a new virus, belonging to the family of *corona* viruses, which also cause common cold. The strain is believed to have originated from animals, though it does not appear to be similar to any known animal or human virus. According to the WHO experts, livestock of southern China may have been the source of the virus causing SARS. In a research at the Erasmus University in Rotterdam, Netherlands, monkeys

infected with *corona* virus developed symptoms similar to that of SARS.

Scientists were almost certain that the new form of *corona* virus, which was first isolated from a patient on 27th March by the Hong Kong University, was the cause of SARS. But this could not be confirmed till the Koch's postulates were confirmed. Finally, after the Koch's postulates were confirmed, it was announced at a meeting of scientists of thirteen laboratories over the world researching on SARS, that the *corona* virus discovered by Peiris is the cause of SARS. Experts say that much laboratory work need to be done to pin point the exact characteristics and to develop a vaccine for SARS may take years.

The new genetic sequencing of the SARS virus by the University of Hong Kong proves conclusively that it comes from animals. Microbiologists from Hong Kong examined a large number of domestic and wild animals including wild rabbits and civets in the Guangdong province of southern China and found the presence of *corona* virus in four civets. Civets are solitary nocturnal animals of the cat family, which do not usually come into contact with humans. But civet meat has been consumed in southern China for centuries. The Chinese fondness of eating civets may have inadvertently set of the SARS epidemic. The possibility that other animals may have been part of the transmission chain has not been completely ruled out. Following this finding Hong Kong suspended the import of civet meat as a precautionary measure. Earlier in 1994, Hong Kong had banned the import of live civets as a measure of disease control and there are no wild civets in Hong Kong.

Symptoms

In the initial stage the disease shows flu like symptoms with fever above 100.4^o Fahrenheit accompanied by chills, headaches, muscular stiffness, after a few days the patient develops, dry cough, shortness of breath and breathing difficulties. The main symptoms of the disease are high fever, shortness of breath and breathing difficulties. Infected patients invariably developed severe pneumonia associated with various complications. Changes in chest x-ray indicative of pneumonia also occur. SARS may be also associated with other symptoms including loss of appetite, malaise, confusion, rash and diarrhoea. The virus multiplies rapidly in the moist air sacs of the lungs. As a defense mechanism the body pumps fluid into the lungs forcing people to grasp for breath. One in twenty succumb to the accumulation of this body fluids in the lungs. The conditions of the patients deteriorates quickly in as little as 5 days.

There is no specific cure to the disease but doctors over the world have been treating the disease with riba-virin -an anti-viral drug and steroids. If treated early the patients generally survive, particularly if they are not suffering from other complications. In Hong Kong, the more complicated cases were usually treated successfully using antibodies in serum from patients who had recovered. Those who survived attained some level of immunity. However experts argue on this point.

Recently, a team of scientists in Hong Kong and USA claimed to have developed a synthetic peptide- an anti-viral agent that is expected to block the entry of *corona* virus into human cells.

Modes of transmission

The disease is thought to spread through droplet infection by sneezing, coughing etc., but such infection can only spread within a radius of one meter. The disease can also spread indirectly as the virus can survive outside human host for 3-6 hours. Contact with any object, which has been tainted by the virus, like telephones, or door knobs may also occur particularly if the patient touches the eyes, nose or mouth with tainted fingers. The virus is highly concentrated in the discharges of mucous and phlegm, when the victim is very sick and needs hospitalization. Therefore, the virus has tended to spread among health care professionals treating victims and close relatives. US health officials believe that SARS could spread through air making it far more contagious. According to the WHO experts, SARS appears to be less infectious than influenza and is not highly contagious when protective measures like surgical masks are used. However, the Hong Kong Health Experts strongly disagree. In Hong Kong, sewage, faeces and cockroaches were suspected carriers of the disease. But, the virus can be easily killed by a solution of water and household bleach. The virus was relatively stable and hence the control of the disease was easier. Experts believe that if the virus becomes less stable, and mutates in future the disease could then cause havoc.

The disease is found to occur in clusters as among hospital staff; community groups or in apartment houses. Such clustered occurrence reflects the fact that transmission occurs more due to direct contact, rather than air borne infection. The airborne infection may be the salient source of infection during air flights or in the rapid transit system.

Another characteristic of the disease is that the disease seems to spread through "super spreaders" - individuals, responsible for infecting a large number of persons. The result is clustered occurrence.

Incubation Period

Incubation period is the time from the exposure to the causative agent to the onset of the disease. This is particularly important as it forms the base for the recommended control measures including quarantine, contact tracing and home isolation. Incubation period can vary from case to case according to the route by which the person is exposed, dose of virus received and other factors including immune status. Estimates of the incubation period is further complicated by the facts that some patients have had multiple exposures to the virus. The particular exposure, which caused the infection, may be impossible to determine. The disease has an incubation period of 2-7 days, 3-5 days being more common before the patient starts to show flu like symptoms. The maximum incubation period is 10 days. Longer incubation period could reflect the difference in methodology, specificity of diagnosis, route of transmission, infection dose and other factors.

Reliable diagnosis has been particularly difficult to establish in this outbreak, as diagnosis is based on a set of non-specific symptoms and clinical signs that are also seen in several other diseases.

There is no full proof method of testing SARS. The most common is the DNA based test called PRC. A cell based immunofluorescence test shows the best result, but it takes 10 days to get the result. This may have serious implications, as the suspected

patients need to be isolated or quarantined. This not only weighs on the public finance, but also causes much anxiety among those infected and their families. A third, an antibody based test called ELISA is also being developed.

Spread of the Disease

The disease started in November 2002 in the city of F'oshan, in rural Ciuangdong Province of South China when the microscopic virus jumped the species barrier from animals to humans and instead of dying it multiplied and spread. The first officially recorded case was that of a 40-year-old, businessman.

By January 2003, Guangzhou, capital of Guangdong district of southern China had recorded a number of cases of the mysterious disease. Liu Jianlun, one of the town's top doctors, (who treated the SARS cases) went to attend a family wedding in Hong Kong; there he stayed in the Metropole Hotel. He showed symptoms of the disease like sneezing and coughing and in the process infected the Hotel lift. Jianlun, unwittingly infected twelve other people at the hotel He developed pneumonia like conditions and was admitted to Kwang Wah Hospital. At his deathbed, he confessed to doctors at the hospital about the disease. Though he died on 4th March, he had actually passed on the infection to seventy-seven of the hospital staff.

Another guest at the Metropole was admitted to Prince of Wales Hospital, where he infected seventy of the hospital staff and a kidney patient.

The kidney patient visited his brother at Amoy Gardens, four times before he died of the disease. This apartment block became

the center of the spread of the disease in Hong Kong, where more than 300 people were infected. The Government later quarantined these flats to prevent further spread of the disease.

Another guest of the Metropole, Kwang Sui-Chu (78) flew back to her family in Toronto, infected her son and daughter-in-law, triggered the epidemic in Canada and died of the disease on 5th March 2003.

A Chinese American businessman, Johnny Chang, also a guest at the Metropole Hotel flew to Hanoi, Vietnam where he fell ill and was admitted to hospital. He infected twenty- two hospital staff, before he died.

Carlo Urbani, an infectious diseases specialist with the WHO, posted in Hanoi was called to examine Chang's condition. He was fascinated by the case, identified the virus, realized the threat, cautioned the Vietnamese Health officials and alerted the WHO at Geneva. Realizing that, he too could be infected, Urbani quarantined himself and his team inside the hospital, But later he and four of his team members died of the disease.

Esther Mok (26), a former flight attendant, on a shopping trip to Hong Kong was also a guest at the Metropole. She returned to Singapore, developed the symptoms and was admitted to hospital. A number of family members and friends of the church, visited her in hospital, thus she passed the virus on to many of those who visited her. Though she recovered, her parents and the pastor of the church died of SARS.

Global Distribution

Till date SARS has affected 8458 persons in 31 countries worldwide. 64% of the

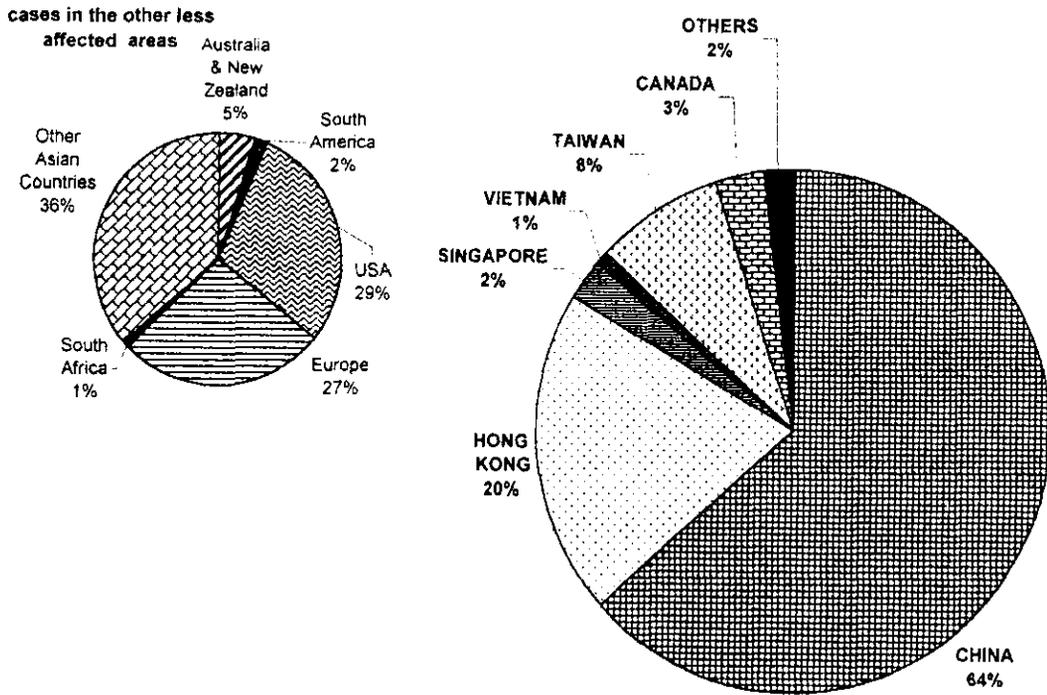


Fig. 1 Distribution of SARS Case: In the Principally Affected Areas

people affected are in China, followed by Hong Kong 20%, Taiwan 8%, Canada 3%, Singapore 2% and Vietnam 1%. The 25 other countries, which reported SARS cases account for only 2% of the total number of people affected. Of this, other Asian countries report 36% of the cases, USA 29% and the European countries 27%. Australia and New Zealand, South America (Brazil) and South Africa account for 5%, 2% and 1% of the cases respectively. (Fig. 1) Most of the patients acquired the disease while traveling abroad in South East Asia.

Asia outside the principal SARS affected region recorded 47 cases, i.e., 36% of the cases occurring outside the principal SARS affected area. These include, Philippines 26%, Mongolia and Thailand 19%

each, Malaysia 11%, India and South Korea 4% each, Indonesia and Japan 4% of the cases, and Kuwait and Macao 2% each.

USA recorded 29% of the cases outside the principal SARS affected countries. But the disease did not spread and deaths did not occur due to efficient management and proper isolation. Most of the cases were found close to the Canadian border. USA had advised its people not to travel to Canada, particularly to the SARS affected areas of Toronto, unless it was absolutely necessary.

In Europe the disease had spread over 11 countries. Germany recorded the highest number of cases, 29% followed by France 20%, Italy and UK 12% each, Sweden 9%, while Finland, Ireland, Romania, Russia, Spain and Switzerland recorded 3% or one

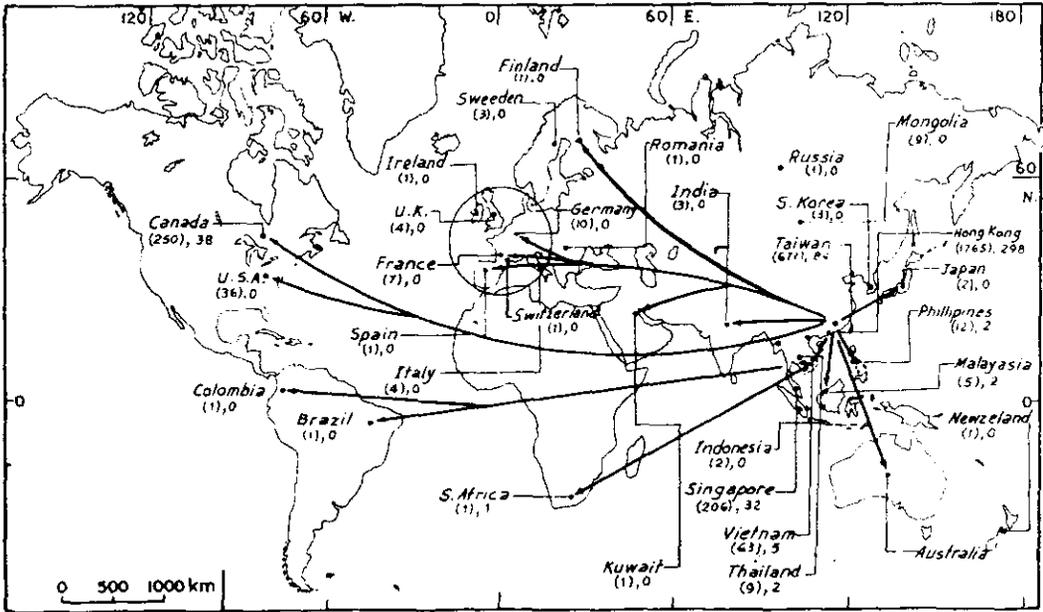


Fig. 2 World Distribution : Infected (8458) Deaths : (807)

case each. In most of the cases, the disease was contracted while traveling abroad. The disease did not spread within the region and only one death was recorded in France. The case fatality rate was 14% for France, and only 3% when examined against the incidence data for the whole of Europe. (Fig. 2)

A total of 807 deaths were recorded world wide, 42% of the deaths occurred in China, 37% in Hong Kong, 10% in Taiwan, 5% in Canada, Singapore 4%, Vietnam 1% and rest of the world 1%. Of the 1% deaths in other countries, Asia recorded 74% and 13% each in Europe and South Africa (Fig.3)

Out side the principal SARS afflicted area, deaths were recorded only in Malaysia, Philippines and Thailand. Case fatality rate for the region as a whole stands at 6 %. When the country wise data is taken into consideration the case fatality rate work out as 40%, 17% and 22% for Malaysia, Phil-

ippines and Thailand, respectively. Incidentally, the recent WHO update does not include Japan among the Asian Countries affected, probably because the suspected cases have been later tested negative.

Case Fatality Rate

Calculation of case fatality becomes difficult before the epidemic subsides. Case fatality ratio measures the proportion of people who die from the disease to those affected. It measures the likelihood that the disease will kill its host and is thus an important indicator of the severity of the disease and its significance as a public health problem. The likelihood that a person will die of SARS could be influenced by factors related to the SARS virus, the route of exposure, and the dose of virus. Personal factors like age or the presence of other diseases and access to prompt medical care are other predisposing factors.

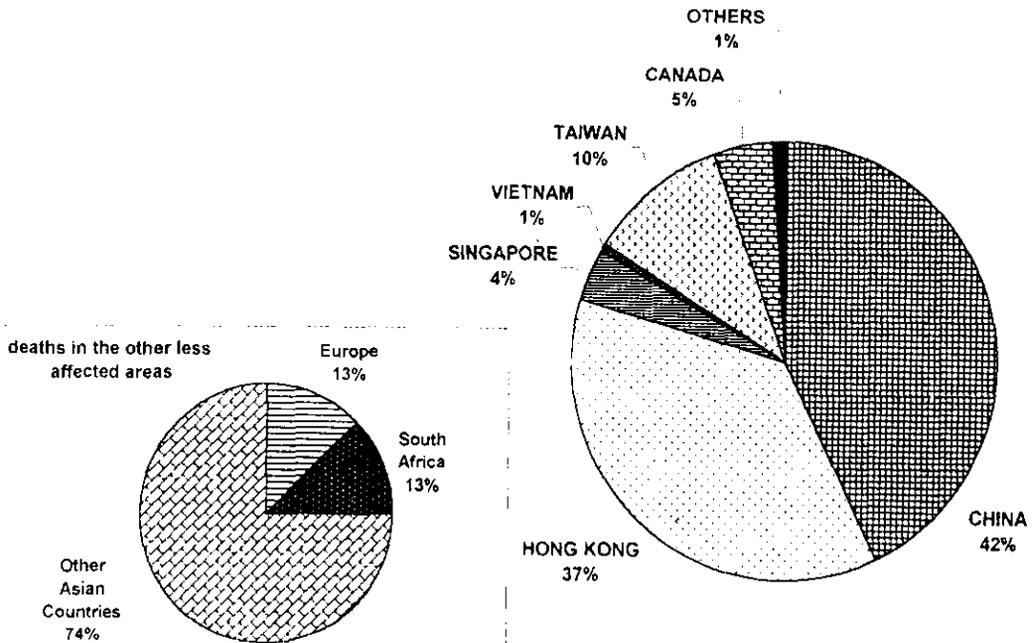


Fig. 3 Deaths in Principal SARS Affected Areas

Table 1 Case Fatality Rate by Age Groups

Age Groups (Years)	Case Fatality Rate (Percent)
0-24	1
25-44	6
45-64	15
65 & above	50

Deaths from SARS usually occur after several weeks of illness. full recovery may take even longer. Case fatality rate increases with age. The rate is lowest among the younger age group 0-24 years. However, among school going children in China the rate is 4.1% Though the incidence rate is only 14/100.000 school children. Deaths are higher in older age groups, particularly among those who have other health complications. The overall case fatality ranges between 14-15%. (Table 1)

The lower case fatality rate in Vietnam is due to the fact that the disease affected the younger age group of relatively healthy, health care workers. The lower case fatality rates for China, however, may be due to under reporting, loss of virulence of the disease, or the age characteristics of the population.

Table 2 Case Fatality Rate in Selected Countries

Countries	Case Fatality Rate
Hong Kong	17%
Singapore	16%
Canada	15%
China	7%
Vietnam	8%
Taiwan	13%



Fig. 4 Distribution of SARS in China

China

The disease is believed to have originated in Guangdong Province of Southern China and had been prevalent in the region, since November 2002. It attracted the world attention only when the disease spread to Hong Kong and then to the other countries of the world. The disease affected 5327 and killed 348 people by August 2003, and spread over 21 of China's 31 provinces. (Fig. 4)

In the initial stage the government tried to cover up the epidemic and in so doing it had allowed the disease to spread. The

disease spread rapidly in China due to the government's delay in responding to the crisis. China reported of SARS months after it had first occurred. By the time the disease had spread to Beijing and from there to the adjoining areas. It had affected the military as well. By early April the death toll had reached 100, and the case fatalities were more widespread than previously recorded.

The World Health Organization intervened, visited the affected areas and sought permission to visit the military hospital at Beijing. It accused the military for attempting to cover up. The actual cases were

six times higher than that reported. But the military had their own system of reporting which did not link with the official records.

China responded firstly, by removing its Health Minister and the Deputy Secretary of the Beijing Municipal Committee and appointed trouble-shooters like Wang Quishan as Mayor of Beijing and Wi Yi as Minister of Health. But this did not have the desired effect.

These changes coincided with the major policy changes and the public health campaign, which began in mid April. The May Day celebration and the week long, National holiday was cancelled. Schools and colleges were closed. Universities and restaurants were closed or remained empty. Long distance travel and private parties were severely restricted to minimize public gathering. Any one who wished to entertain more than 30 guests had to seek permission from the government. It suspended all entertainment centers like *karaoke* houses, internet bars, electronic game bars, theatres and cinemas. The Beijing Municipal cultural bureau, the public security bureau, the industrial and cultural bureau jointly decided to suspend all their activities in keeping with 'the law of epidemic prevention and treatment'. The sources said the resumption of these businesses would depend on the progress of the control of the SARS epidemic. All these had acute socio economic consequences.

There was acute shortage of hospital staff, doctors and nurses. Major hospitals in the capital were sealed off and emergency measures like quarantine was invoked. The Government announced that it would spend two million Yuan to combat the SARS outbreak.

China opened a numbers quarantine centers in different parts of the country, which could house thousands of people. It deployed Communist party cadre to monitor the spread of the SARS. In a desperate bid to check the spread of SARS, 3000 investigators were deployed to search for patients and ensure that measures were taken to improve hygiene. In some areas each household was issued with a thermometer and an emergency contact number, while offices and businesses were directed to install temperature-monitoring systems.

The confused people reverted to traditional superstitions, herbal tonics, seeking places far removed from public. Some people, in fear of infection did not venture out of doors.

Others took indefinite leave from work. Those who were compelled to go to their work chose to travel by bicycles rather than use public transport and the bicycle sales shot up.

There was deep-seated insecurity in the society. The SARS hysteria was worst in Beijing. The residents felt helpless, since their government had lost all credibility after denying for several weeks, that SARS was an acute problem. The Beijing authorities issued a circular to quarantine people, areas, animals and products infected, or suspected to be infected. The mass hysteria led to enraged farmers agitating against the opening of a quarantine center in a village in eastern China. A school near Beijing also earmarked as a quarantine center was torched. 300 people rioted against construction of SARS observation center in North China. Local bodies blocked passenger and freight traffic to and from areas infected with SARS. Fearful that pets were spreading the

virus the Chinese police and vigilantes killed pet dogs and cats in the most gruesome manner. All these illustrate how the SARS epidemic led to mass hysteria in China, where government information of how to control SARS lacked credibility.

The WHO team had access to information but were debarred from making their observations public. The WHO team recommended the Beijing municipal authorities to improve surveillance and reporting system, but the authorities urged the media against publicizing the outbreak. There was growing concern of SARS spreading to the countryside when migrant workers ignored the government call and traveled to their rural homes. This led to all entry and exit points being now monitored by cadres. The Hebei Province, the home of Beijing's floating population was of particular concern to the WHO, as well. There was fear that the disease will spread to rural areas, where it would remain uncontrolled.

Hong Kong

Hong Kong is the second most SARS affected country. It accounted for 20% of the cases but 37% of the deaths recorded over the world. The case fatality rate was highest. The disease had spread here from southern China and from here it spread worldwide. It created panic among the people, who adopted the wearing of masks. Though schools were initially closed, the students returned to school wearing surgical masks. But unlike China the people had faith in the government. The first center of spread was Metropole Hotel followed by a block of apartments in Amoy Gardens, where more than three hundred cases occurred. The whole block was quarantined off to check

further spread of the disease. The government launched a massive clean up drive of the area and timely controlled the outbreak but not before it had claimed 298 lives.

The central, western and southern parts of Hong Kong and the smaller islands had sporadic cases. The main outbreak was in the north, the new territories and around Kowloon, where the intensity of the disease was greatest and the disease persisted for over two months till mid-May.

The disease spread to Taiwan much later, and affected 671 people killing 84. Taiwan accounted for 10% of the total cases and 8% of the total deaths and had a case fatality rate of 13%.

Singapore

Singapore recorded 4% of the cases and 2% of the deaths. There was wide spread panic and the people resorted to wearing surgical masks in all public places, but the disease occurred in closed community groups. Vietnam accounted for 1 % of both cases and deaths. The lower case fatality rate in Vietnam is due to the fact that the disease affected the younger age group of relatively healthy, health care workers. Vietnam was the first country to become free of the disease. (Fig. 5)

Canada

Canada is the only country outside South East Asia, where the disease persisted and spread within closed communities in Toronto. A second outbreak occurred in Canada, in the end of May, after the country was declared free of SARS. A country is usually declared free of the disease, only when no new cases of the disease occur

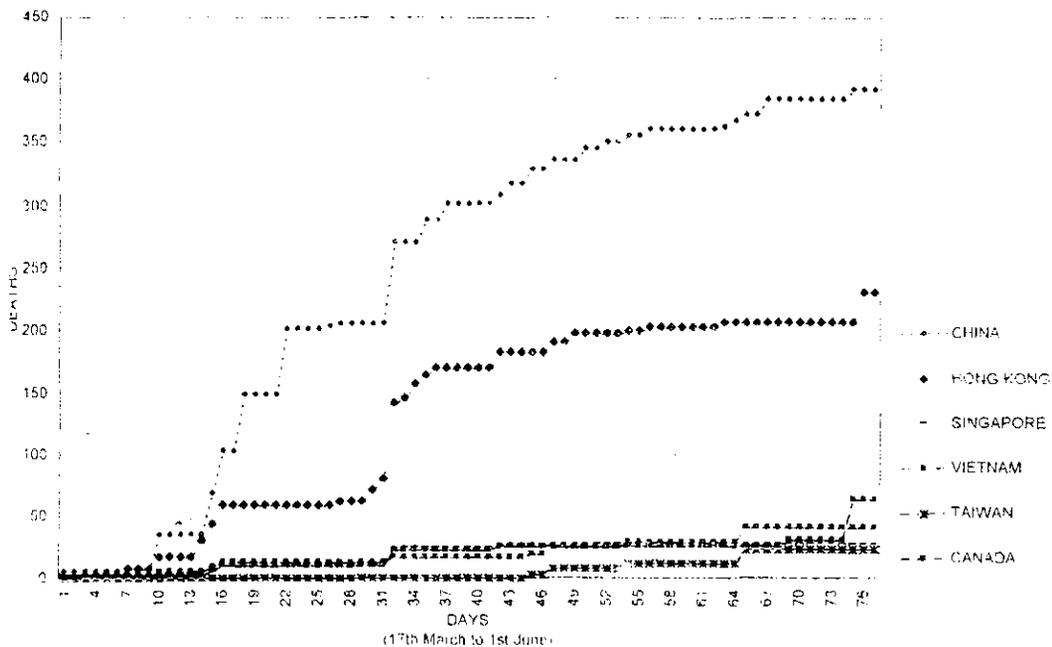


Fig. 5 Reported deaths from SARS in selected countries

within 20 days, i.e., two complete incubation cycles.

According to WHO, **India** had three confirmed cases of SARS all of which were contracted from abroad! But official records confirm nine cases. In Pune, lapse on the part of airport authorities led to the spread of the disease among family members. Strict quarantine measures brought the disease under control. But there was much social ostracism that the patients had to endure.

Measures on Control

A number of precautionary measures were imposed to prevent SARS from further spreading globally. Wearing masks while on flight was one of the essential measures recommended. Passengers were also requested to immediately contact medical officers in

case of discomfort both on flight and immediately after landing. Free medical counseling was also being provided to those embarking on a journey. Health officials were posted in airports over the world to look for patients arriving from China, Hong Kong, Singapore, Vietnam and Taiwan.

As a precautionary measure those who were traveling via Singapore or Hong Kong and had to avail of a 6-7 hour stopover were requested not to venture into the city. Ground staff worldwide took care to observe all passengers at the check in counter, medical attention are being provided. Passengers were not allowed to embark on their journey unless approved by the doctor and were put under quarantine if they were found ill at the time of disembarking at their destination.

Economic Implications

The SARS panic had drastically affected trade and tourism. Some passengers cancelled their flight bookings; others shelved their travel plans. Many countries asked their citizens not to travel to Asia. Many companies asked their staff to postpone meetings and trips to the SARS affected countries. Many important conferences, scheduled to be held, in these countries were cancelled. This forced the Asian Airlines to cut their services. The Iraq war had already affected air travelers. SARS was a further blow on the airlines. More than 100 flights were cancelled. There was nearly a 60% drop in air travel to these countries. The overall region suffered a 20% drop in flight bookings in the first four months of the year with a 44% decline in April. This was the worst blow that affected the tourism industry since 1989.

The Singapore government asked companies badly affected by SARS to cut salaries rather than lay off their workers. The civil servants in Singapore under took a 10% cut in their salaries to tide over the economic crisis.

To combat the depression in the tourist industry, 'the Pacific Asia Travel Association and the International Air Travel Association have launched on a promotional campaign. A total of 102 regional industries, including 27 airlines and 11 hotel chains together with regional tourist organizations met in Singapore in the end of May to formulate strategies to market Asia as a SARS safe tourist spot and also to coax its own citizens to take a holiday.

Countries have come up with different proposals. Chinese Government has offered a 6 million Yuan soft loan to the tourism industries and has promised to waive taxes and administrative fees. Philippines international Airport is offering a 50% reduction in parking fees to foreign airlines, and a cut in landing and departure fees by 10-15% for a short period only. Thailand is promising tourists huge sums of financial compensation, should the tourist contract SARS. Special price tourist packages are being provided. Hotel Confederates are promising a free night stay for every night paid for and discounts of 20-50% for golf courses, spas and resorts together with a lucky draw. Some are planning carnivals, travel fairs and special festivals. They plan to attract 50,000 new tourists. All these activities are expected to revive the economy from the economic strains that resulted from the SARS epidemic.

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