SARS: A mysterious pneumonia
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Etiology
A virus has been defined as the etiological agent. Initially it was thought to belong to paramyxovirus (same group of Measles, Mumps, RSV). Subsequently it was confirmed that it is caused by an RNA virus, a Corona virus of same family that cause common cold. It was presumed that the SARS virus was originally a virus of pig which somehow has mutated or recombined in a fashion that permitted it to infect, cause the disease and pass from person to person. The 'CROWN' name is from it's resemblance to flower/crown in shape. The name Urbani SARS associated virus (after the name of the doctor who first described it) has been proposed (Fig-1).

Fig.-1: Crown on flower like(SARS Co-V) SARS Virus

Spread
Spread occurs through respiratory droplets and contact with secretion of the patients. Spread of SARS may occur in three ways: 1. Close contact 2. Distant contact 3. Unknown ways.

Close contact (droplet infection) may be a. direct b. indirect. Droplet is the drops coming through sneezing, coughing or spaking from patients and causing infection.

Incubation period
This is the time period elapsed between exposure to an infection and appearance of it's symptoms. In SARS it was initially thought to be 2-7 days, it has been accepted by Central disease control (CDC) USA as 10 days. This is because of reinfection occurs in SARS like flu. Quarantine and isolation for patients or exposed ones is 10 days. Because of reinfection it has become difficult for physician to predict the danger period of the disease for patient. People with active disease are definitely contagious but it is not known how long he is contagious either before or after the infection.

Source of SARS
SARS was originated in Guangdong province of Southern China. First victim was a businessman Foshan city. It was in November 2002, similar cases with outbreak were treated then as atypical pneumonia with conventional approaches.

It first came into international attention when a physician from Guangdong province became
sick in a hotel in Hong Kong. So first case diagnosis as SARS was on 26 Feb/2003, first physician diagnosed the case was Dr. Urbani, a WHO worker. Dr. was affected by the disease and died in March 29/2003. Guangdong is an agricultural area with thousands of farms with small and large animals. First affected person lived in ninth floor of the hotel with seven others in same floor. These eight persons and four other guests became affected and became index cases of SARS and transported the disease wherever they landed viz., Vietnam, Singapore, Canada, Ireland, USA there. It is good that in a short time it could be detected that causative agent of SARS is a virus and it belongs to the RNA virus of corona group. Corona virus mostly cause disease in one host species usually species. Corona virus usually causes upper respiratory illness (not pneumonia) in humans; it causes pneumonia and diarrhoea in animals. SARS corona virus is now through to be a novel virus with unique virulance to cause upper and lower respiratory tract (pneumonias) infections in humans. SARS virus was initially through to be a virus of pig which has been mutated to become infections and to spread disease. It was also through that it was a recombinant of either two human or one human and one animal virus which imparted it's virulence. None of these preposition is accepted now. It is recognized now SARS virus is a previously unrecognized corona virus (possible through identification of antibodies convalescent serum of patients), probably from a nonhuman host that somehow acquired the ability to infect humans. If it jumps from an animal and loses its original host the reservoir of infection is lost and it would be very easy to eliminate the disease. If there is no mutation it would be very easy to get a vaccine for the disease.

**Statistics**

The disease is continuing to Occur. New transmission still occurring in China, Taipei, Singapore, Hong Kong, inner Mongolia. Many places like Vietnam could contain the disease. Some province of China still having the grave sequences. Number of new cases are decreasing day by day. So far total number of cases reported to WHO from 28 countries including the United States is 8,240 with 745 death- case fatality proportion: 9.0% (date: 28-5-03). WHO recommended those who travelled in those areas should keep track of their contact. It also restricts nonessential travel to Guangdong, Hebei province, Hong Kong special administrative area (SAR) of China and inner Mongolia, Taipei. It prohibits blood transfusion from SARS patients up to after twenty one days. WHO defined SARS cases as 1) Suspect and 2) Probable. It has updated the definition by inclusion of clinical, laboratory and epidemiological of the disease.

**Suspected case**

Has been defined as cases having 1. temperature greater then 100.4°F (38°C), and 2. one or more of the clinical features of respiratory illness (viz. cough, shortness of breath, difficulty in breathing) and 3. travel within ten days of onset of symptoms to an area with documented or suspected community transmission of the disease or 4. close contact within ten days of onset of symptoms with a person.

**Probable case**

Suspected cases with one of the following: 1. Radiographic evidences of pneumonia or respiratory disease syndrome (ARDS) or 2. Autopsy findings consistent with ARDS without an identifiable cause. *Travel (including transit in airport) within ten days of symptoms to an area with documented disease or recent transmission of it. **Close contact is defined as having cared for, living with or having direct contact with respiratory secretion or with body fluids of a person within ten days of infection. Examples of close contact 'are kissing, embarrassing and sharing, eating, drinking utensils, close conversation <3 ft), physical examination and any other direct physical contact between persons. Close contact does not include activities such as walking by a person or sitting across a waiting room or office for a brief period. Recent transmission means outbreak of the disease or new cases within
SARS symptoms
Comorbid symptoms: Fever (100.4°F-38°C), cough, difficulty in breathing, shortness of breath, chill< shaking, aches, headache. Less common symptom: Dizziness, productive cough, sore throat, runny nose, nausea, vomiting, diarrhoea. SARS initiates with fever and associated symptoms, three days later respiratory features like dry cough, difficulty in breathing occurs which progresses to shortness of breath and hypoxia to respiratory failure.

SARS sign
Auscultation of Lungs may yield creps, ronchi and other features of pneumonia.

SARS-Lab tests
A quick sensitive test is yet to be introduced.

X-ray chest and CT chest
Shows progressive changes Chest x-ray may help to confirm the diagnosis (Fig-2,3).

Figure 2: Pneumonia in X-ray chest Figure3: CT scans of chest of SARS confirm SARS patients

Hematology
Index cases have been shown to have leukopenia, lymphopenia, thrombocytopenia of different grades and biochemical tests have shown raised LDH, CPK and ALT with decrease of Na, K; all these tests favor a viral etiology.

Test of virus
Isolation of virus (Which can be done by PCR, cell culture) and antibody tests (ELISA, IFA). Virus have been identified from culture with electron microscopy. Polymerase chain reaction (PCR) can detect genetic particle. ELISA (enzyme linked immunosorbtant assay) can detect antibodies after 21 days. IFA (immunofluorescence assay) detect IgM after

Recommended specimens for evaluation of potential cause of SARS
Patients may be category raised in three settings. 1. outpatient 2. inpatient 3. fatal cases. In outpatient setting we can take a. nasopharyngeal and oropharyngeal swabs or aspirates b. whole blood c. acute or convalescent serum d. stool. For inpatient setting along with above specimen's bronchoalveolar lavage, tracheal aspirate or pleural tap can be examined. For fatal cases fixed tissue specimens from major organs like liver, spleen, brain, Kidneys, lungs, or frozen tissues from lungs, upper respiratory tract can be used.

SARS treatment
As it has been confirmed that SARS is a viral infection antibodies has no role in treatment. In complicated cases, superadded infection it may be used. Broad spectrum antiviral like ribavirin has been used with some satisfactory result in Hong Kong. High dose steroid has been used in some initial cases with ARDS with no proven effect. Symptomatic and supportive treatment like O2 and mechanical ventilation is neede9 in many cases. Neuraminidases (anti influenza drugs) have also been used. So far, there is no approved drug with proven activity against SARS.

SARS prognosis
Reinfecion has troubled the prediction of outcome in many cases. Time is to come yet to say about the mortality, but it would be better to remember that mortality from community acquired pneumonia in USA is 4.9% and total number of deaths from influenza is estimated to be 35000. In early cases fatality rate was 4%. It has been seen that fatality increases with age; 14% at 45>50% above 65 yrs. Overall fatality rate so far is 15%. SARS cases recovers spontaneously, those who recover resolution is complete. Life long immunity is not predicted like that of flue. 10-20% needs mechanical ventilation and more than these needed ICU care.
SARS prevention

As treatment is yet to define we can take various measures to prevent it. 1% can done through 1. Effective vaccine 2. Control of infection and 3. Control of spread of the disease. Vaccine may not be impossible but in usual process it takes time as different phases of studies are needed. For control of infection in a. inpatient settings one must have 1. Standard precaution like hand hygiene i.e., washing of hand with soap and water each time, use of alcohol based disinfectants when soiled with patient's secretions and after removal of gloves, measures for eye protection, masks etc. 2. Contact precaution with use of gown, gloves 3. Airborne protection like isolation of patient in a room with negative pressure use of N-95 disposable respirator and ordinary surgical masks to prevent airborne pathogens.

In b. outpatient setting with 1. surveillance for possible exposure 2. compulsory wearing of gown, gloves, masks for health worker along with their practice of standard precautions. In c. home setting with adoption of standard and contact precaution exposed persons should be restricted to house. Cleaner should use gloves, gowns, goggles, masks. Wards cabin should be cleaned daily, during discharge and during transfer of patients. All horizontal surfaces (viz., table, chair floor etc) should be cleaned. Commonly used disinfectants (quaternary ammonium based, phenol based, alcohol based products) used for other purpose in hospitals suffices i.e. no special disinfectant has been recommended for SARS. Patient care instruments like stethoscope, BP instruments ventilator etc. should be cleaned. Fumigation has been advised.

Control of spread

Spread of SARS can be done in three ways; 1.Isolation 2.Quarantine 3.Surveillance at international borders

1.Isolation : It is for the person who are ill. Isolation can be done at home, hospital or any health care facilities. It is mostly voluntary but patient may be compelled in special circumstances. China in recent days has announced punishment for violation of its rule of isolation and quaranitn which range from imprisonment to death. In USA patients are asked for isolation for 10 days after the appearance of symptoms.

2.Quarantine : Can be imposed by the state by declaration and enforcement of it within it's international border.

3.Surveillance at international borders : We have three international airports, two sea ports and thirteen points of check post at borders. To stop SARS outbreak we are to tighten surveillance in this places as we have business and traffics with other Asian countries with serious SARS outbreak. Russia has closed its border with China to stop spread of SARS. Goods, foods, from countries of SARS do not spread {also handing money} to other countries. Departure from endemic areas of person who have fever respiratory symptom and history of exposure should be postponed. In case of arrival who has history of exposure and who is sick should be isolated in special word in our infectious disease hospital. If no symptom and not sick but has history of close contact he/she may be kept under surveillance for 10 days.

Conclusion

SARS is a mysterious deadly pneumonia of viral origin. It is fortunate that the cause has been identified promptly. Quarantine and strict isolation can contain the disease which has been proved by this time. We are lucky we have no SARS cases so far. The virus does not mutate so vaccine will be developed soon. A polymerase enzyme responsible for growth and development of the virus is known, so drug discovery is quite possible. Whatever it is we should remain vigilant. There is no alternative to awareness to combat the disease.