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COVID-19 THE CORONAVIRUS (SARS-COV-2) IS A PANDEMIC DISEASE

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ABSTRACT

Coronavirus disease (COVID-19) is an infectious disease caused by a newly discovered, new strain of coronavirus (SARS-CoV-2). Most of the persons infected with the COVID-19 virus are found to develop mild to moderate respiratory illness. The disease has been characterized as a pandemic. The geriatrics and the person having medical problems like cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more likely to develop serious illness. How to prevent and control the transmission is well stated about the COVID-19 virus also it's causes and therapy. The infection can be protected by washing hands or using an alcohol based rub frequently and not touching to eyes or face. When an infected person coughs or sneezes, the virus spread out through droplets of saliva or from nose. Hence, wearing face masks to cover the face is highly necessary to modulate the infection. The anti-viral drugs (Favipiravir-200mg and Remdesivir-100mg IV infusion) recently have declared as treatment for the virus. As no specific assured vaccines are researched out against COVID-19, it is better to control the community spread for which general public as well as the Government authorities must come forward.

KEYWORDS

COVID-19, SARS-CoV-2, Favipiravir-200mg and Remdesivir-100mg.

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INTRODUCTION

A novel coronavirus (SARS-CoV-2) that emerged out of the city of Wuhan, China, in December 2019 has already demonstrated its potential to generate explosive outbreaks in confined settings and cross borders following human mobility patterns[1].

Chinese scientists confirmed that a new coronavirus named severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the cause of pneumonia outbreak. Now, this severe acute

respiratory syndrome has been termed as coronavirus disease 2019 (COVID-19) by the World Health of Organization (WHO)[2].

Coronavirus is a group of viruses categorized into Alpha-coronavirus and Beta-coronavirus often causing cold and other mild upper respiratory tract infections in the human body. Alpha-coronavirus consists of HCoV-229E and HCoV-NL63; Beta-coronavirus consists of HCoV-OC43 and HCoV-HKU1. Nevertheless, the rare form would be lethal such as SARS, MERS and COVID-19 (Geller *et al*, 2012). SARS-CoV, MERS-CoV and SARS-CoV-2 are betacoronavirus[3]. However, SARSr-CoVs belong to the subgenus Sarbecovirus (previously lineage B) of genus Beta-coronavirus and occupy a unique phylogenetic position. It's the most lethal[4].

The number of cases of COVID-19 in the province of Hubei, the disease epicenter, quickly climbed following an exponential growth trend. The total number of COVID-19 cases is at 80,859, including 3100 deaths in China as of Mar 8, 2020 (WHO, 2020)[5].

Since there is no currently available vaccine to prevent a COVID-19 infection, the best method to prevent the infection is by avoiding exposure. The Centers for Disease Control and Prevention (CDC) has published online information relating to prevention (CDC, 2020). To prevent acquiring the infection through the eyes, the CDC recommends that all people avoid touching their eyes. Many hospitals also recommend wearing eye protection and mask to minimize risk of transmission.

VIRAL STRUCTURE

The virus consists of four main structural proteins: The Spike glycoprotein (S) - These proteins radiate from the lipid envelope of the virus and give it the solar corona (crown-like) appearance under the electron microscope. They play an important role in the binding of host cell receptors and entering into it. Membrane protein (M) and envelope protein (E) which are involved in virus assembly, nucleocapsid protein (N) which is joined to RNA genome to make nucleocapsid, in addition to other proteins which plays vital roles in replication of the virus and facilitate entry into the host cells (Figure No.2).

CAUSES

SARS was caused by a coronavirus (CoV) and identified in 2003 according to the World Health Organization (WHO). CoV is an animal virus from bats which infected human in Guangdong province, China[6].

COVID-19 is similar to SARS, also caused by a CoV that occurred in the seafood and wet animal wholesale market in Wuhan, Hubei Province, China[7].

TRANSMISSION

COVID-19 spreads mainly through droplets which are produced by coughing or sneezing from an infected person. The infection can happen in two ways: (Figure No.1).

Direct close contact

One can get the infection by being in close contact with COVID-19 patients (within one metre of the infected person), especially if they do not cover their face when coughing or sneezing.

Indirect contact

The droplets survive on surfaces and clothes for many days. Therefore, by touching infected subjects/clothes and then touching the mouth, nose or eyes can transmit the disease. The incubation period of COVID-19 is 1-14 days.

The average incubation period for COVID-19 expands to 5 days and the period of quarantine is 14 days from the last date of exposure. It was the longest incubation period for similar types of coronaviruses. However, it's remained argumentative since the longest incubation period for COVID-19 can be 27 days or above according to the present-day finding[8]. Recently, there is a patient dog infected from its nasal and oral cavity with a low level of COVID-19 virus. It's not shown any signs of disease before. This is the first case of human-to-animal transmission that has been confirmed by the experts from School of Public Health in the Hong Kong University, College of Veterinary Medicine and Life Sciences in the City

University of Hong Kong and the World Organization for Animal Health[9].

SYMPTOMS

The symptoms of SARS and COVID-19 are divided into systematic and respiratory disorders (Table No.1). Systematic disorders of SARS and COVID-19 are fever, cough and fatigue. The major respiratory disorders of COVID-19 and SARS are rhinorrhea, sneezing, sore throat and pneumonia but COVID-19 patients have more respiratory symptoms than the patients with SARS[10]. The total time between exposure to COVID-19 commonly around five to six days but it can range from 1-14 days.

DIAGNOSIS

SARS

Different Laboratories are performing SARS specific PCR (Polymerase chain) tests should adopt strict criteria for confirmation of the positive results, especially in low prevalence areas, where the positive predictive value might be lower.

Commercially the PCR-kit for SARS is available. The procedures have been published and can be adapted by laboratories. The PCR tests for SARS depend on the specimen and the time of testing of illness. It may result in real cases of SARS testing (-) ve by PCR (false negative results). The sensitivity can be increased with multiple specimens/ multiple body sites are tested.

If the quality controls guidelines will be followed for the technical procedures then the specificity of PCR tests for SARS will be better. Sometimes the laboratory contamination may produce false positive results. Therefore, every positive result should be verified properly.

SARS-CoV-2 (COVID-19)

At present nucleic acid detection techniques like reverse transcription-polymerase chain reaction (RT-PCR) are considered as an effective method for confirming the diagnosis in clinical cases of COVID-19 (148). Several companies across the world are currently focusing on developing and marketing SARS-CoV-2 specific nucleic acid detection kits (Table No.2). Also, multiple laboratories are developing their own in-house RT-PCR[11]. The specific detection of SARS-CoV-2 is listed under Table No.3.

TREATMENT

SARS

Protease inhibitor for treating human immunodeficiency virus (HIV) infection has also been considered as a treatment for SARS. Lopinavir-Ritonavir co-formulation (Kaletra) blocks the virus replicase polyprotein and prevents the replication of RNA. This is able to reduce the intubation and mortality ratese specially administered in the early stage with ribavirin and corticosteroid[12].

Ribavirin can suppress the replication of RNA virus. It has been used in treating hepatitis C virus, lassa fever virus and severe respiratory syncytial virus infection[13].

Corticosteroid is commonly used as an immunomodulatory agent to modulate inflammatory cytokines to achieve immune homeostasis.

COVID-19

First option is to repurpose broadly acting anti-viral drugs that have already been used for other viral infections. Broad spectrum antiviral drugs have been used in treating COVID-19 infection e.g oseltamivir, lopinavir, ritonavir and ganciclovir regimen; remdesivir and chloroquine regimen[14]. Anti-inflammatory therapy using drug-like glucocorticoids, cytokine inhibitors, JAK inhibitors, and chloroquine/hydroxychloroquine should be done only after analyzing the risk and benefit ratio in COVID-19 patients.

However, recently in the month of June-21th 2020 Glenmark syntheses Glenmark Pharmaceuticals said it has launched antiviral drug Favipiravir (Figure No.3A), under the brand name Fabi Flu, for the treatment of patients with mild to moderate COVID-19 at a price of Rs. 103 per tablet. For the treatment of influenza previously Japan was used Favipiravir and now also for COVID-19 patients.

Even China was using it and Russia had also given permission in the month of May-2020 to use it.

Similarly, the Hetero also lunched Remdesivir (Figure No.3B) under the brand name Covifor is available in 100mg vial (Injectable) which has to be administered intravenously in a hospital setting under the supervision of a healthcare practitioner. The Hyderabad-based firm said- A single dose vial is likely to cost Rs. 5,000-6000.

Dose of (Favipiravir) Fabi Flu

Fabiflu, is available at 200mg tablet, the price has been fixed at Rs 103 per tablet. Similarly, a single strip of 34 tablets will cost Rs 3,500 for the patients. The recommended dosage duration has been fixed for 14 days. On the day-1, a dose of 1,800mg is recommended twice a day, which is followed by 800mg twice a day from the day-2 up to 14th day. The total 14 days treatment cycle costs will Rs.14, 000 to the patients.

Dose of (Remdesivir) Covifor

Severe COVID-19 disease is defined as patients with oxygen saturation (SpO2) ≤94% on room air or requiring supplemental oxygen or requiring mechanical ventilation or requiring extracorporeal membrane oxygenation (ECMO)

Requires mechanical ventilation and/or ECMO-

For Day-1 the loading dose: 200mg IV infused over 30-120 min, then follow up

From Days 2 to10 the maintenance dose: 100mg IV per day.

Does not require mechanical ventilation and/or ECMO-

For Day-1 the loading dose: 200 mg IV infused over 30-120 min, then follow up

From Days 2 to 5 the maintenance dose: 100mg IV per day.

5 additional days up to 10 days total may be extended if there will be no clinical improvement for the patient.

PREVENTION (Community prevention)

To prevent the spread of SARS and COVID-19, measures are based on effective infection control and isolation as assured vaccination is not developed still.

SARS

If home isolation is not feasible for individual patients, it is necessary to use alternative facilities in the community for the isolation of SARS patient. In most cases, the community isolation facilities will be in-house in SARS-CoV disease. For these types of patients significant health care is not necessary. Similar principles, which are applied to home isolation, can be applied to community isolation facilities. The personnel who are in the facility must be trained for an N-95 respirator.

COVID-19

In the month of December 2019, in Wuhan Hubei Province, China, number of people suffered from severe respiratory illness. On 31st December 2019, China informed the World Health Organization (WHO) about the number of patients with symptoms of respiratory illness of unknown cause.

In the late of January government gradually declared to close all primary schools, secondary schools, Technical Educational Institutions and special schools for community prevention.

On 25th March 2020 Prime Minister of India announced countrywide lockdown with social distancing restriction over the majority of commercial activities and mass gathering including educational and public institutions. In such an exceptional situation of the century, we are living in it is crucial to understand how people are adapting to the constraints imposed on by the government due to corona virus lock-down and its impact on given population and their routines and habits. The Rail train services have been suspended from 23th of March 2020 and to prevent close contacted high-risk cases in India. Wearing of face mask and proper hand-sanitization guidance are issued to the public (Figure No.4).

Table No.1: Various Symptoms of SARS and COVID-19 with respect to Systemic and respiratory disorder

S.No	Disorders	SARS	COVID-19
1	Systemic	High fever	Fever
		Headache	Headache
		Cough (Dry)	Cough
		Fatigue	Fatigue
		Diarrhea (10-20% of patients)	Diarrhea (2% of patients)
			Sputum production Haemoptysis
2	Respiratory	Rhinorrhea	Rhinorrhea
		Sneezing	Sneezing
		Sore throat	Sore throat
		Pneumonia	Bilateral pneumonia
		Mild respiratory problems	Acute respiratory distress symptoms

Table No.2: Diagnostics Kits for SARS-CoV-2as per FDA-approved, as of 30th March, 2020

S.No	Kit Developer	Diagnostic Platform
1	Laboratory Corporation of America (Lab Corp)	COVID-19 RT-PCR Test
2	Bio Fire Defense, LLC	Bio Fire COVID-19 Test
3	Avellino Lab USA, Inc.	Avellino CoV2 test
4	Primer design Ltd.	Primer design Ltd COVID-19 genesig Real-Time PCR assay

Table No.3: Specimens collection for detection of SARS CoV-2

S.No	Sample	Recomondation#
1	Bronchoalveolar lavage fluid	**+++**
2	Sputum	**+++**
3	Nasal swabs	**+++**
4	Pharyngeal swabs	**++**
5	Feces	**+**
6	Blood	**+**
7	Urine	**+**

As per the Journal reference[15] +++, strong; ++, moderate; +, weak

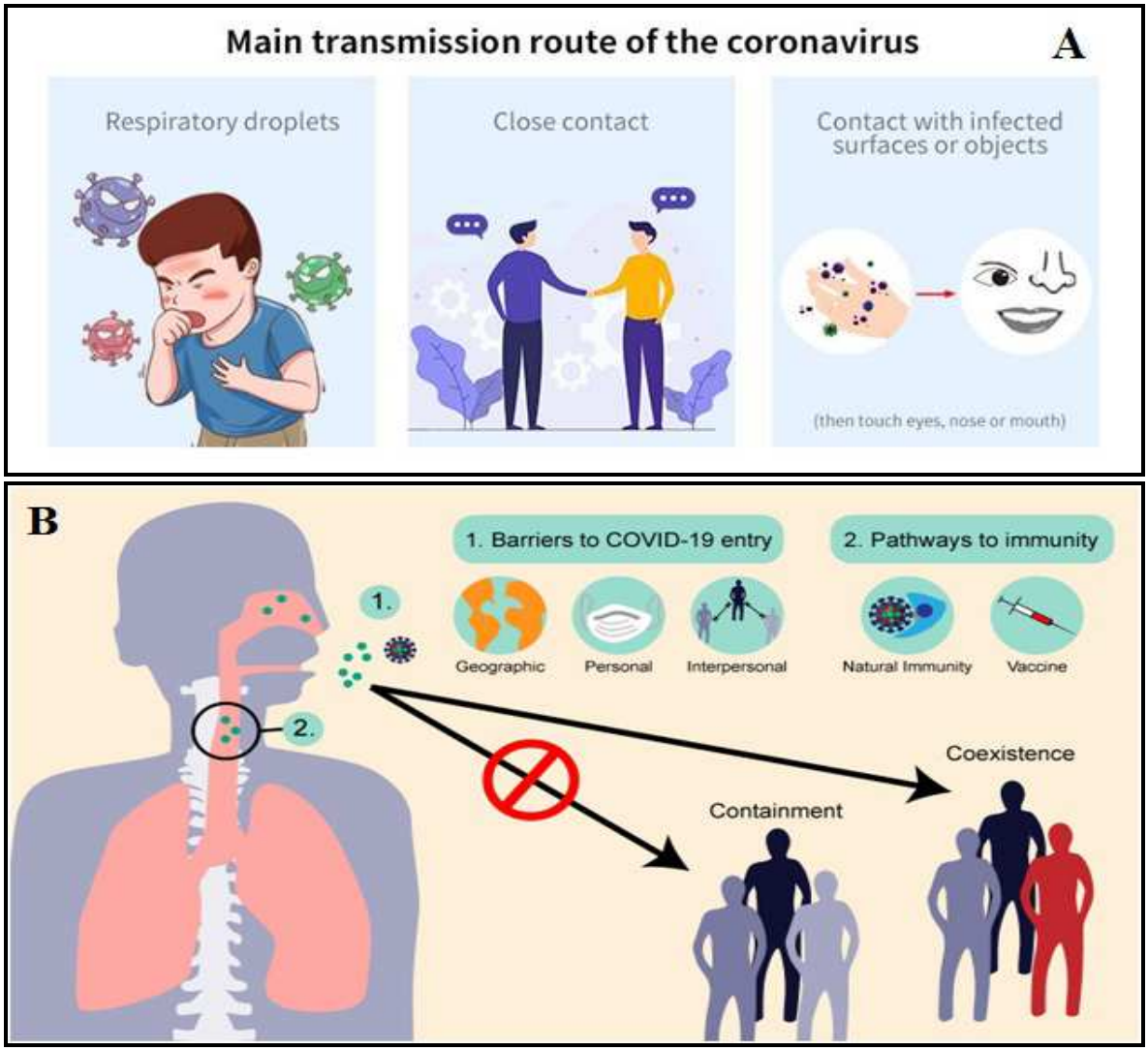

Figure No.1: A- Direct close contact, B- Indirect contact leads to COVID-19 spreads

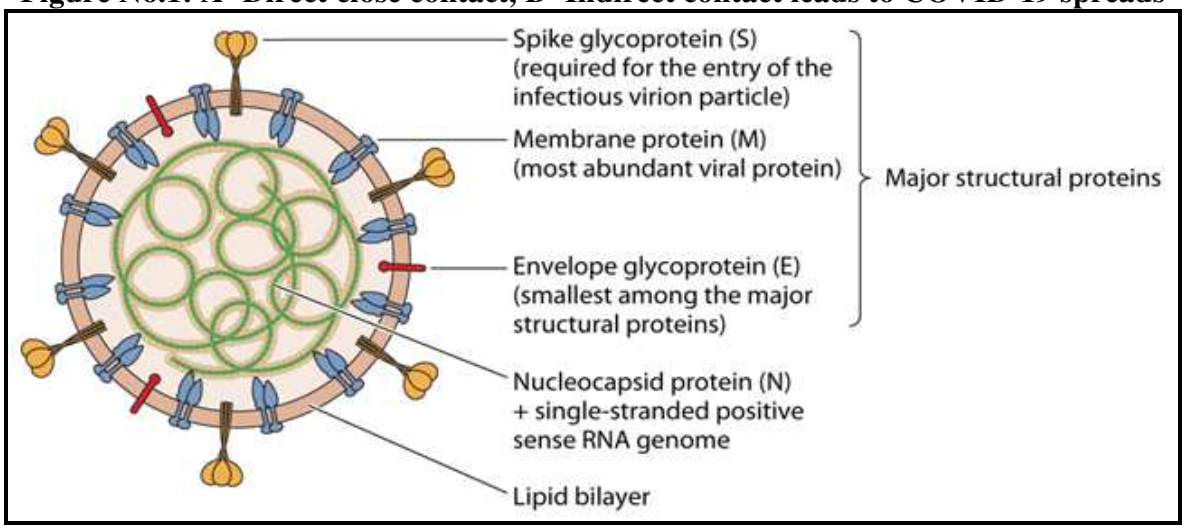

Figure No.2: Structure of SARS-CoV-2 virus

Figure No.3: A- (Favipiravir) Fabi Flu, B-(Remdesivir) Covifor

Figure No.4: A/B- Hand sanitization, C/D- Face mask

CONCLUSION

The COVID-19 epidemic has become an aggressive clinical threat to the general population and healthcare professionals around the world. It is better to take preventive measure to control the further infection till vaccination is developed. Personal hygiene and protection are the most important for preventing the spread of COVID-19 such as wearing a mask and washing hands as well as reducing social contact including avoiding crowds, working in home. The guidelines which are issued by the government from time to time in favor of the public are to be strictly followed.

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CONFLICT OF INTEREST

We declare that we have no conflict of interest.

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