



COVID-19: Diagnosis and Cure; Review

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ABSTRACT

In 2019 COVID-19 (novel coronavirus disease) declared as a global health emergency. It is firstly reported in Wuhan, China. 11 February 2020, the approximate number of confirmed cases in China has reached 38 800, with 4740 (12.2%) cured cases and 1113 (2.9%) deaths. After that COVID-19 creates a worldwide threaten with a huge number of deaths. Developed countries like USA, Italy, united Kingdome etc., all are affected with COVID-19. There is no vaccine is reported till dated for COVID-19, only precautions and social distancing is the solution of this problem. Many diagnosis methods are used to detect COVID-19 positive numbers like Ground-glass and consolidative opacities with CT scan, Quantitative real-time reverse transcriptase-polymerase chain reaction (RT-qPCR) assay, Real-time polymerase chain reaction (RT PCR), Antigen ELISA. Many Scientist and medical workers try to get the solution of this infectious communicable disease. There are many treatment methods to cure this syndrome which are included here. This review has collective information about diagnosis and cure methods with current researches on Coronavirus and COVID-19.

Keywords: COVID-19, RT-PCR, ELISA

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INTRODUCTION

Start with the history of human coronavirus, the first evidence was seen in 1965 when Tyrrell and Bynoe. It is present in human embryonic tracheal organ cultures isolated from the respiratory tract of an adult with a common cold. In the late 1960s, Tyrrell was developed a leading group of virologists, they work on many human strains and animal viruses. All the viruses were examined morphologically by an electron microscope, here they get a new group of viruses known as a *coronavirus* (It showing the crown-like appearance with their surface protein so name as *corona*) [5]. In 2003 SARS coronavirus (SARS-CoV) is explored in animals, perhaps bats, civet cats. In China 2002 first infected human was found in Guangdong province declared by world health organization. On 31 December 2019 first unknown pneumonia case in Wuhan and reported to WHO office in china. 30 January 2020 WHO declared it as a Public Health Emergency for the entire world and after research named as COVID-19 a novel *coronavirus*. According to current status by WHO at 19 April 2020 the number of an infected person is given in table 1.

S.No.	Regions	Confirmed cases	Deaths
1	European Region	1,122,189	100,938
2	Region of the Americas	821,860	38,258
3	Western Pacific Region	131,115	5621
4	Eastern Mediterranean Region	124,691	5908
5	South-East Asia Region	27,319	1185
6	African Region	13,892	628

Indian current situation report by WHO on 12 April 2020 are 8447 COVID19 cases, 765 who has been cured/discharged and 273 deaths.

About Coronavirus

Corona belongs to the largest group of viruses of order Nidovirales. Alpha, beta, gamma and delta are the four subgroup of coronavirinae. It is highly communicable in due to the presence of S protein present in receptor binding domains (RBD) (6). The life cycle is given in table 1.

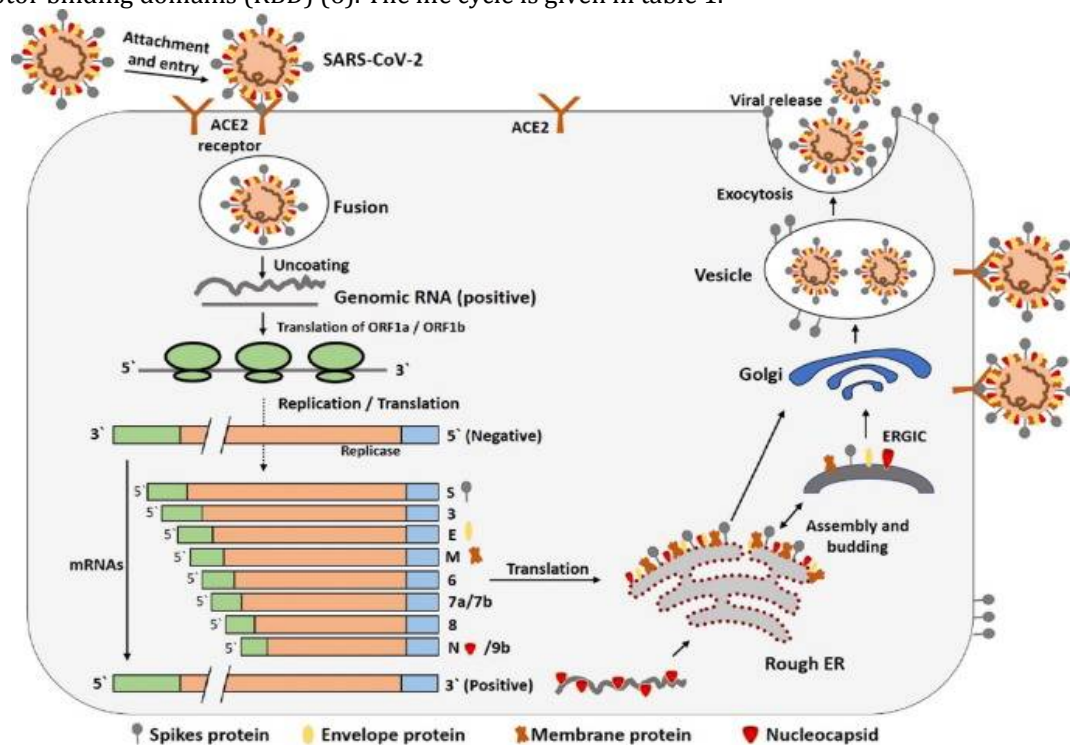


Figure 1: The life cycle of COVID 19 begin with S protein binding with host cell membrane

DIAGNOSTIC METHODS

Ground-glass & consolidative opacities with a CT scan. One of the methods uses for diagnosis in radiology is a Ground-glass and consolidative opacities with CT scan indicate in lungs filled with air spaces and partial collapse of lungs alveoli. [7] It is commonly associated with lungs disorder like lungs inflammation or infiltrative. Ground-glass opacities having selected features to give more accurate and predictive results followed by computed tomography. Many researchers give statistical numbers about the patients diagnosed with this method. [8] The radiologist performs a crucial role for early investigation of novel coronavirus (COVID-19) computed tomography findings. It is also helpful in recognizing other diseases like viral pneumonia with similar viral family-like SARS and MERS [1].

Quantitative real-time reverse transcriptase-polymerase chain reaction (RT-qPCR)

Many types of SARS-COV-2 nucleic acid test kit have been evolved and authorized quickly, with the time; 'suspected' cases were increased with standard clinical COVID-19 attributes and identical particular computed tomography (CT) images were not diagnosed. Quantitative real-time reverse transcriptase-polymerase chain reaction (RT-qPCR) assay has method been used for the detection of causative viruses from respiratory discharge and the end pathogenic diagnostics of COVID-19. Unluckily, due to massive situation in local hospitals, many diagnosed cases and 'suspected' cases couldn't systematically be separated or treated. Newly, one patient wasn't confirmed by RT-qPCR testing for SARS-COV-2 infection for the first three times within 3 weeks before bronchoalveolar lavage fluid (BALF) was obtained, results from RT-qPCR testing was positive for SARS-COV-2. Overall conditions were coherence to control viral extending and breakout. For example, results from RT-qPCR testing using primers in the ORF1ab genes and N genes can be infected by the modification of viral RNA sequences [2].

Real-time reverse-transcription-polymerase-chain-reaction (RT-PCR)

The real-time reverse-transcription-polymerase-chain-reaction (RT-PCR) assay has been progressed and used in clinics for COVID-19. RT-PCR remains as the standard reference to make a positive diagnose of COVID-19 infection, the false-negative rate (FNR) increases and unavailability of RT-PCR assay in the initial stage of the breakout controlled and early diagnosis of infected patients. RT-PCR positive for COVID-19 remains the common reference. Still, RT-PCR results can be changed by low virus load and sampling errors. Earlier studies about SARS revealed that RT-PCR deficits sensitivity during the initial five days of the disease. Recent information indicates that chest CT may signify pneumonia but multiple RT-

PCR of nasopharyngeal or throat swabs tests negative. Moreover, RT-PCR results must be scanned by the Centers for Disease Control and Prevention (CDC) in the initial stage of a breakout, taking a prolonged time to confirm the final diagnosis [3].

Antigen ELISA

It is also one of the diagnostic methods for detection of the corona. Commercially this assay is work on two immunoglobulin’s IgG and IgA and shows higher sensitivity with IgA. There are two major structural protein of coronaviruses is a major problem are a spike (S) for attachment and nucleo-capsid (N) immunogens. Antigen ELISA is a serological assay for virus-neutralizing antibodies, antibodies against N protein, S protein and receptor-binding domain (RBD) in serum samples of PCR confirmed SARS-CoV-2. In this study antigen, ELISA plays a key role in sero-surveillance studies and evaluation of vaccine trials [4].

Types of diagnostic tests	Specific tests by CT(computed tomography)	Immunoassay Antibody based Antigen based	Molecular test by PCR(polymerase chain reaction)
How does it work?	Detect symptoms and signs of disease	Detects the presence of viral proteins(antigens) in a sample	Detects the Existence of anti-viral antibodies in a sample
What technique is used?	Techniques comprises thermal scanning to identify person with a fever(higher than normal temperature) and computed tomography (CT) chest scans to differentiate from other chest infections	Commonly based on a technique called enzyme linked immunosorbent assay (ELISA), in which molecules merge to the antibodies or antigen in the sample and produce a detectable signal	Commonly bases on a technique called polymerase chain reaction (PCR), which makes millions of copies of a particular section of the viral genome, amplifying least amounts to detectable levels.
Where does testing take place?	Commonly performed outside of the laboratory, in clinic, or at point of care, depending on equipment needs	Might be laboratory based or performed at point of care, depending on test design	Commonly performed in a laboratory due to equipment needs
What is the most common use?	Triage/screening to find candidates for advance testing	Examine overall infections suspected and immunity having COVID-19 rates in or triage/screening a community to find candidates for advance testing (assessing on test design)	Testing people suspected of having COVID-19
A positive result...	Proposes a potential infection and suggests that advance testing is needed.	Shows a current or recent past infection, and SARS-CoV-2 may be used to infection or screen for proposes a current infection potential infection (tests may not be (assessing on test dependable in design) initial phase of infection)	Confirms a recent SARS-CoV-2 infection

Table 2: comparison of diagnosis methods

Curative methods

As we all know the novel coronavirus disease 2019 (COVID-19) is spreading rapidly and the most effective cure is social distancing. Chloroquine phosphate is an old drug used for malaria treatment and it is also effective for pneumonia caused by COVID-19. Chloroquine showing broad-spectrum antiviral activities, it increases endosomal pH which is required for virus fusion (9). Other than chloroquine and some other drugs are in clinical studies on COVID-19 in china like arbidol, remdesivir and favipiravir. Ribavirin is given intravenous in combination with IFN-α or lopinavir/ritonavir. IFN-α is usually used for hepatitis and inhibit SARS CoV reproduction *invitro*. lopinavir/ritonavir is given to HIV patients and it shows anti-SARS CoV activity *invitro*. Favipiravir is approved in China on February 15, 2020, for treatment of novel influenza it acts as an inhibitor for RNA dependent RNA polymerase (RdRp).

Remdesivir nucleoside analogue shows antiviral activity by reducing viral load in lung tissue of mice infected with MERS-CoV(10).

National Institute of Allergy and Infectious Diseases (NIAID), a part of the National Institutes of Health (NIH) developing mRNA vaccine with candidate working SARS CoV S protein. (11). It's a modern technique for curing the disease, but still on trial phases.

Convalescent plasma therapy

COVID-19 takes viraemia peaks in the first week of infection in most viral illness. The patient commonly improves a primary immune response by days 10-14, which is followed by virus clearance. Convalescent plasma or immunoglobulin has been used as a last solution to enhance the survival rate of patients with SARS whose state continued to fade despite treatment with pulsed methylprednisolone. Consequently, it should be more effectual to dispense the convalescent plasma at the primary stage of the disease. A meta-analysis by Mair-Jenkins and their team expressed that the death rate was decreased after taking several doses of convalescent plasma in patients with severe acute respiratory infection with no adverse effects or drawback after treatment. Most necessarily, the recent guidelines highlighted that systematic corticosteroids should not be given routinely for the treatment of COVID-19. But, the convalescent plasma therapy which was used in patients who suffered from viral infections was cured without any severe adverse effect. Consequently, it might be more worthwhile to test the safety and efficacy of convalescent plasma transfusion in SARS-CoV-2-infected patients [12].

Biotherapeutics use passive immunotherapy for a viral infection such as monoclonal antibodies. The potential of monoclonal antibodies against SARS-CoV and MERS-CoV coronavirus are in knowledge is used on COVID-19. The different monoclonal antibody has a greater anti-viral activity which is used for the treatment and prevention of viral escape [13].

Preventive measures which have been used as masks, hand hygiene practices, social distancing, contact history, and quarantines are a major way to reduce transmission. No specific antiviral treatment has approved to reduce effectively; hence, infected people can follow the instructions of doctors in COVID 19 treatment centers. [14]

DISCUSSION

COVID-19 lockdown the whole world, researchers have no successful tool to cure this syndrome. Here we collect the information of different diagnosis and cure methods that are being developed recently. In this review article, we compare all the diagnosis methods which will help the researchers to develop a new and fast method of diagnosis. Early-stage diagnosis is very essential to stop the chain of virus and to control human to human transmission.

It also includes curative/treatment methods that are reported now a day. A combination of different medicine may give a fast result to fight against the disease. If we isolate the antibodies that are produced after infection from the recovered patients and develop it artificially gives better treatment to COVID-19. These artificial antibodies cannot allow the virus to be a mutant.

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