Review Article

A Scoping Review: Life Cycle, Diagnosis and Current Treatment Strategies of Coronavirus Disease (COVID-19) Outbreak

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ABSTRACT

In December 2019, the erupt of the novel coronavirus ailment (COVID-19) in China spread far and wide, transforming into an emergency of critical overall concern. SARS-CoV-2 ailment causes gatherings of extraordinary respiratory affliction like genuine serious respiratory issue coronavirus. Human-to-human transmission through dabs, contaminated hands or surfaces has been depicted, with bring forth times of 2-14 days. Early investigation, separate, and consistent prescriptions are essential to fix patients. Prescriptions, including antiviral pros, chloroquine and hydroxychloroquine, corticosteroids, antibodies, picking up quality plasma transfusion and vaccinations, are analyzed in this article. Likewise, enlisted preliminaries examining treatment alternatives for COVID-19 contamination. COVID-19 is containing single abandoned (positive-sense) RNA related with a nucleoprotein inside a capsid included grid protein. A common CoV contains in any event six ORFs in its genome. All the basic and frill proteins are deciphered from the sgRNAs of CoVs. Four fundamental basic proteins are encoded by ORFs 10, 11 on the 33% of the genome close to the 30-end. The hereditary and phenotypic structure of COVID-19 in pathogenesis is significant. The transmission of COVID-19 disease starting with one individual then onto the next brought about the segregation of patients who were in this manner given an assortment of medicines. To screen the present flare-up, strong advances have been taken the world over to decrease the transmission of COVID-19 disease especially restricting global and household flights, accepting lockdowns in defenseless regions, social separating and so on. No clinically affirmed antiviral medication or antibody against COVID-19 is accounted for yet. Notwithstanding, in clinical preliminaries, barely any wide range antiviral medications were assessed against COVID-19 contamination which brought about clinical recuperation.

Keywords: Covid-19, Life cycle, Genome structure, Treatment, Prevention.

INTRODUCTION

There is a current overall episode of another sort of coronavirus, which began from Wuhan, China and has now spread to 140 different nations, including Japan, Korea and Italy. The World Health Organization announced that COVID-19 has become a worldwide wellbeing concern, causing extreme respiratory tract diseases in people. Momentum proof demonstrates that SARS-CoV-2 spread to people by means of transmission from wild creatures unlawfully sold in the Huanan Seafood Wholesale Market. Phylogenetic investigation shows that SARS-CoV-2 is another individual from the Coronaviridae family however is particular from SARS-CoV (character of around 79%) and MERS-CoV (personality of roughly half) . Strikingly, SARS-CoV-2 offers an elevated level of hereditary comparability (96.3%) with the bat coronavirus RaTG13, which was acquired from bats in Yunnan in 2013; nonetheless, bats are not the prompt wellspring of SARS-CoV-2.[1]

Novel coronavirus (2019-nCoV), formally known as extreme intense respiratory disorder coronavirus 2 (SARS-CoV-2), the etiological specialist of the COVID-19, rose in Wuhan, Hubei area, China. On eleventh March 2020, The World Health Organization proclaimed this illness as pandemic. Without any known proficient treatment and in view of the circumstance of a "general wellbeing crisis", numerous medications have been attempted as of late in the treatment for COVID-19 that incorporates a minimal effort antimalarial tranquilize chloroquine and its subsidiary hydroxychloroquine (HCQ), alongside a few other antiviral drugs. [2]

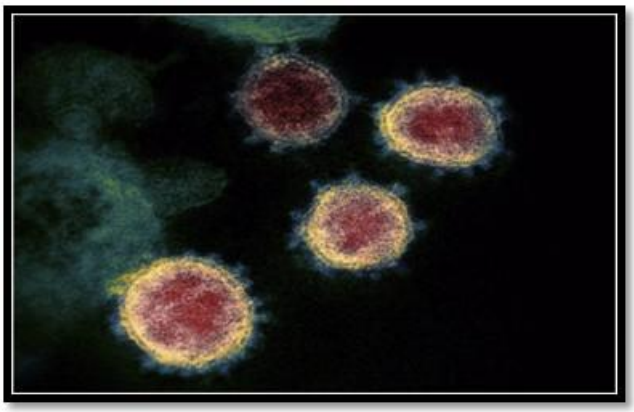


Figure 1: Transmission electronic microscope image of COVID-19 illustrating the characteristic crown-like spikes on the outer rim.

The brooding time of COVID-19 contamination is roughly 5.2 days. There are general likenesses in the manifestations between COVID-19 and past betacoronavirus. In any case, COVID-19 gave some one of a kind clinical highlights that incorporate the focusing of the lower aviation route as clear by upper respiratory tract

side effects like rhinorrhoea, sniffling, and sore throat. Moreover, patients tainted with COVID-19 created intestinal side effects like looseness of the bowels just a low level of MERS-CoV or SARS-CoV patients showed the runs.

SYMPTOMS OF COVID-19[1-4]

- Fever
- Sore throat
- Fatigue
- Cough
- Dyspnea
- Dry cough
- Lymphopenia
- Haemoptysis
- Headache
- Sputum production
- Diarrhea
- Runny nose
- Myalgia
- Pneumonia
- Vomiting

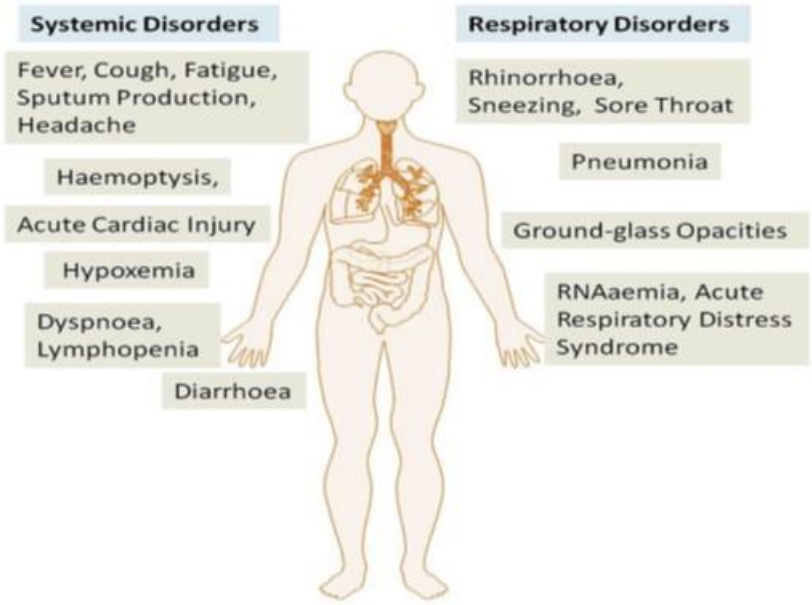


Figure 2: The foundational and respiratory issue brought about by COVID-19 contamination

CORONAVIRUS GENOME STRUCTURE

COVID-19 is a circular or pleomorphic wrapped particles containing single-abandoned (positive-sense) RNA related with a nucleoprotein inside a capsid included grid protein. The envelope bears club-formed glycoprotein projections. Some coronaviruses additionally contain a stitch agglutinin-esterase protein (HE).[5]

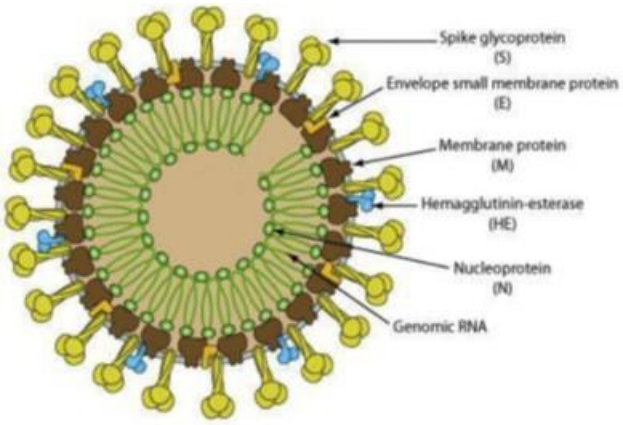


Figure 3: Schematic of a coronavirus e this new virus probably looks a lot like this.

COMPARATIVE PATHOLOGY AND LIFE CYCLES OF SARS-COV AND MERS-COV

Both SARS and MERS cause severe pneumonia resulting from these novel coronaviruses, sharing some similarities in their pathogenesis (Figure 4). [6] SARS is an emerging infectious viral disease characterized by severe clinical manifestations of the lower respiratory tract, resulting in diffuse alveolar damage. SARS-CoV spreads through respiratory secretions, such as droplets, via direct person-to-person contact. Upon exposure of the host to the virus, the virus binds to cells expressing the virus receptors, of which the angiotensin-converting enzyme 2 (ACE2) is one of the main receptors, and CD209L is an alternative receptor with a much lower affinity.[7] In the respiratory tract, ACE2 is widely expressed on the epithelial cells of alveoli, trachea, bronchi, bronchial serous glands,[8] and alveolar monocytes and macrophages.[9] The virus entersand replicates in these target cells. The mature virions are then released from primary cells and infect new target cells [10] Furthermore, as a surface molecule, ACE2 is also diffusely localized on the endothelial cells of arteries and veins, the mucosal cells of the intestines, tubular epithelial cells of the kidneys, epithelial cells of the renal tubules, and cerebral neurons and immune cells, providing a variety of susceptible cells to

SARS-CoV [11,12] Respiratory secretions, urine, stools, and sweat from patients with SARS contain infective viral particles, which may be excreted into and contaminate the environment. Atypical pneumonia with rapid respiratory deterioration and failure can be induced by SARS-CoV infection because of increased levels of activated proinflammatory chemokines and cytokines.[13]

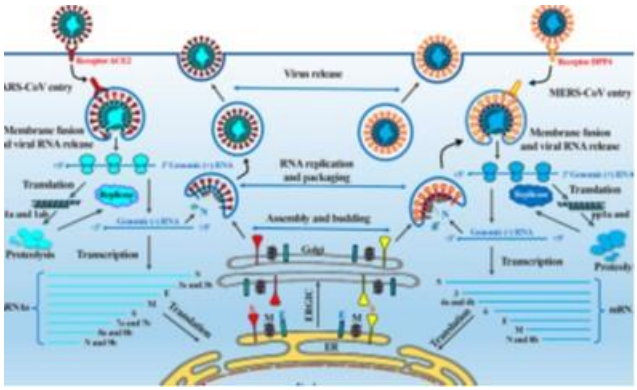


Figure 4: The life cycle of SARS-CoV and MERS-CoV in host cells

SARS-CoV and MERS-CoV enter target cells through an endosomal pathway. The S proteins of SARS and MERS bind to cellular receptor angiotensin-converting enzyme 2 (ACE2) and cellular receptor dipeptidyl peptidase 4 (DPP4), respectively. Following entry of the virus into the host cell, the viral RNA is unveiled in the cytoplasm. ORF1a and ORF1ab are translated to produce pp1a and pp1ab polyproteins, which are cleaved by the proteases that are encoded by ORF1a to yield 16 non-structural proteins that form the RNA replicase–transcriptase complex. This complex drives the production of negative-sense RNAs [(?) RNA] through both replication and transcription. During replication, full-length (?) RNA copies of the genome are produced and used as templates for full-length (+) RNA genomes. During transcription, a subset of 7–9 sub-genomic RNAs, including those encoding all structural proteins, is produced through discontinuous transcription. Although the different sub-genomic mRNAs may contain several open reading frames (ORFs), only the first ORF (that closest to the 50 end) is translated. Viral nucleocapsids are assembled from genomic RNA and N protein in the cytoplasm, followed by budding into the lumen of the ERGIC (endoplasmic reticulum (ER)–Golgi intermediate compartment). Virions are then released from the infected cell through exocytosis. SARS-CoV, severe acute respiratory syndrome coronavirus; MERS-CoV, Middle East respiratory syndrome coronavirus; S, spike; E, envelope; M, membrane; N, nucleocapsid.

TRANSMISSION

The COVID-19 genomic arrangement examination demonstrated its 88 % personality with two bat-determined serious intense respiratory disorder (SARS) like coronaviruses recommending that bats are the most probable connection between COVID-19 and people. A few investigations have demonstrated that transmission from individual to individual is a potential route for COVID-19 disease to spread. As it was watched COVID-19 contamination happened in numerous individuals who didn't visited Wuhan's wet creature advertise. The Fig.6.how rapidly the ailment has spread in every nation since the 100th affirmed case. An examination was led on COVID-19 tainted ladies having third trimester and no proof was break down which can affirm that transmission can happen from mother to kid. The lung epithelial cells are the essential objective of the infection. It has been expressed that human-to human transmissions of SARS-CoV happens through official between cell receptor known as the angiotensin-changing over chemical 2 (ACE2) receptor and receptor-restricting space of infection spikes. It is essential to make reference to here that receptor restricting space arrangement of COVID-19 is like that of SARS-CoV. These outcomes show that the most probable passage into the host cells is through the ACE2 receptor. [4]

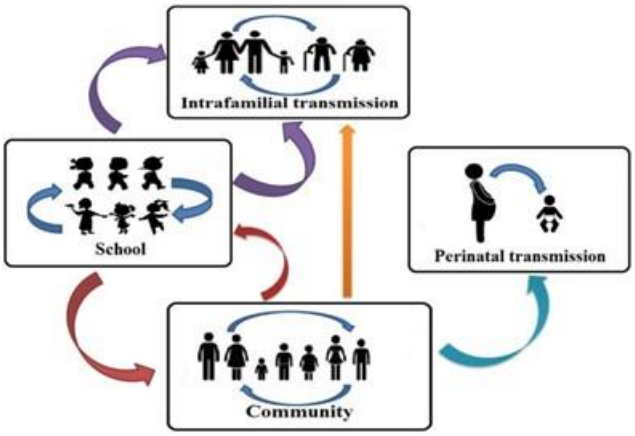


Figure 5: Transmission dynamics of SARS-CoV-2 infection in People

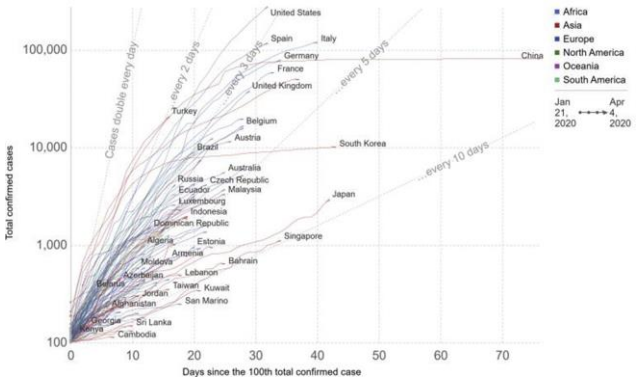


Figure 6: The case fatality rate of ongoing COVID-19 pandemic

SARS-CoV is most promptly transmitted by respiratory beads when a tainted individual hacks or sniffles inside a short separation. The infection could likewise spread when an individual contacts a surface or item polluted with irresistible beads at that point contacted his/her mouth, nose or eyes (SARS, 2017). The normal brooding time frame for SARS inside human is 4 to 6 days, albeit once in a while it tends to be as short as 1 day or up to 14 days (SARS, 2003). SARS patients mystery the infection discharge in respiratory

and stool during the second seven day stretch of sickness and begin to fall apart.

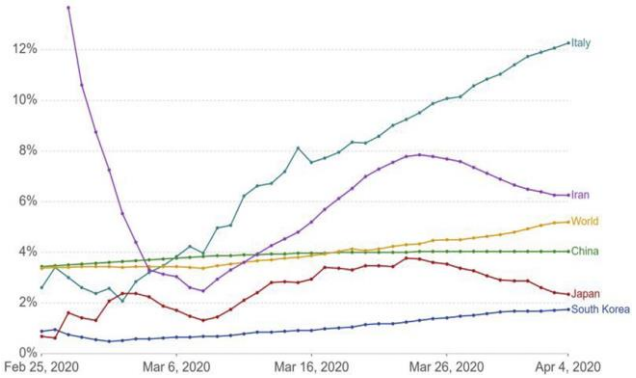
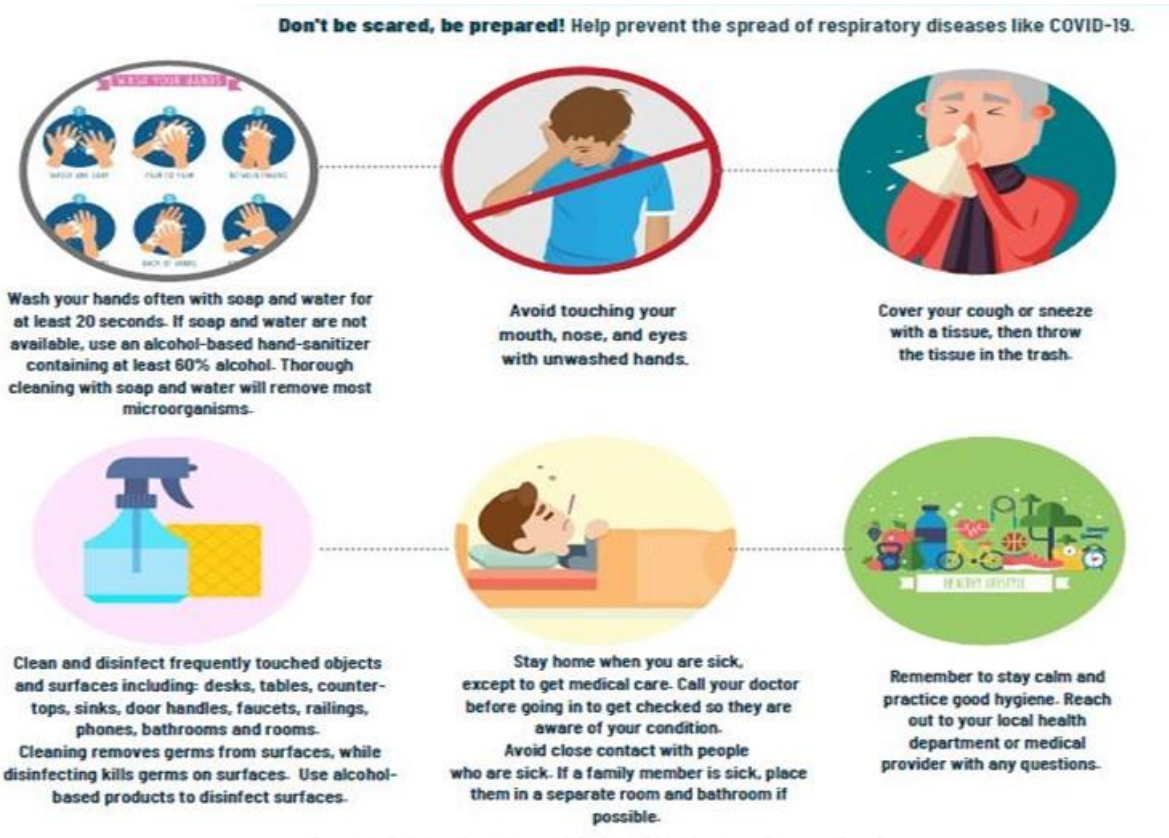


Figure 7: The growth kinetics COVID-19 infection in different countries around the globe as on 4thApril, 2020 (European CDC)

It brought about in excess of 8000 people experienced Severe Acute Respiratory Syndrome (SARS) and caused 774 man's demise in 2002–2003(SARS, 2015). [14] The case Fatality rate (CFR) of any sickness isn't fixed it differs with area and with time. The CFR of continuous COVID-19 pandemic is spoken to in Fig. 7. [4]

PREVENTION

Control and Prevention (CDC) have given counsel on forestalling additionally spread of COVID-19. They prescribe maintaining a strategic distance from movement to high hazard zones, contact with people who are suggestive, and the utilization of meat from locales with known COVID-19 episode. Fundamental hand cleanliness measures are additionally suggested, including successive hand washing and the utilization of PPE, for example, face covers. Japanese based organization Bespoke Inc has additionally propelled a man-made brainpower controlled chatbot (Bebot) that gives state-of-the-art data with respect to the coronavirus episode, precaution quantifies that can be taken, just as a side effect checker.[3]



ROUTINE DISINFECTION PROCEDURE

Object Surface Disinfection

Article surface is cleaned with 1,000 mg/L chlorine-containing disinfectant, cleaned twice with 75% ethanol for non consumption obstruction, when at regular intervals.

Equipment Disinfection

The gear in the sullied territory is cleaned with 2,000 mg/L chlorine containing disinfectant. The DR and CT gantry in the tainted territory are cleaned with 75% ethanol. The hardware in the cushion region is cleaned with 500 to 1,000 mg/L chlorine containing disinfectant or liquor containing dispensable disinfectant wipes two times every day.

Air Disinfection

All focal climate control systems were killed to forestall air sullying with one another.

Polluted Area

The entryway is opened for ventilation, each time in excess of 30 min, when at regular intervals. The air sterilizer is persistently cleaned or the bright beam is ceaselessly

utilized in the unmanned state for 60 min, four times each day, making sure to close the inward protecting entryway during air cleansing. Other encompassing air is showered with 1,000 mg/L chlorine-containing disinfectant and ventilated two times every day.

Ground Disinfection

The ground is cleaned with 1,000 mg/L chlorine-containing disinfectant, when at regular intervals.

When sullied, purify whenever. If there should arise an occurrence of noticeable sullying, dispensable spongy materials ought to be utilized first to totally expel the contaminations, and afterward a fabric doused with 2,000 mg/L chlorine containing disinfectant ought to be utilized for 30 min before cleaning.

Reconfiguration of the Radiology Department

The radiology department was divided into four areas:

1. Contaminated
2. Semicontaminated
3. Buffer
4. Clean areas

The contaminated area is connected to the fever clinic and includes the fever access way, the CT examination room, and the DR examination room for confirmed and suspected cases. One CT scanner and one DR system closest to the emergency department are designated the fever-CT and fever-DR to examine patients with suspected and confirmed COVID-19. There is a separate dedicated access between the contaminated area and the fever screening tents. The semicontaminated area includes the fever-CT control room, fever-DR control room, and other patient examination access areas. The buffer zone includes access areas for medical personnel and a dressing area for technologists. The clean area includes the administrative office and the diagnostic room. The contaminated area was isolated from other areas using physical barricades. Directional signs were newly installed to guide patients and staff.

PERSONAL PROTECTION AND TRAINING OF STAFF

For providing care for patients with confirmed and suspected COVID-19, all hospital staff are required to wear complete personal protective equipment

Clinical defensive dress, careful top, N95 cover, gloves, face shields, and goggles. Wearing and expelling of the hardware must be acted as per the systems and under the oversight of the contamination control nurture. Since staff individuals working in the polluted territory are under much situational pressure, occasionally going on vacation could bring down their physical and mental feelings of anxiety. The technologists on fever-CT obligation shifts are given a break once every week for 4 hours. What's more, the soundness of staff in the debased region must be observed intently for the manifestations of COVID-19. Pregnant staff must be allocated to the spotless zone.

The EMICT occasionally reminds staff to embrace individual measures to decrease disease, for example, wearing covers at all occurrences in the radiology office and N95 veils if working in the defiled territory; not contacting the cover and the eyes; rehearsing hand cleanliness; confronting endlessly from partners when eating, drinking, and talking; and not utilizing individual cell phones while on duty. [15]

DIAGNOSIS[16]

a) Nucleic Acid Detection Technology

- **Real-time quantitative polymerase chain reaction(RT-qPCR):**

It is the golden test for the diagnosis of SARS and COVID-19.

- **High-throughput sequencing:**

The authoritative identification method for SARS-CoV-2.

b) Computedtomography (CT) Scan:

It is the assistant demonstrative technique. The pictures of CT now and again seem respective pneumonic parenchymal ground-glass and consolidative aspiratory opacities with arounded morphology and a fringe lung conveyance when patients contaminated with SARS and COVID-19.

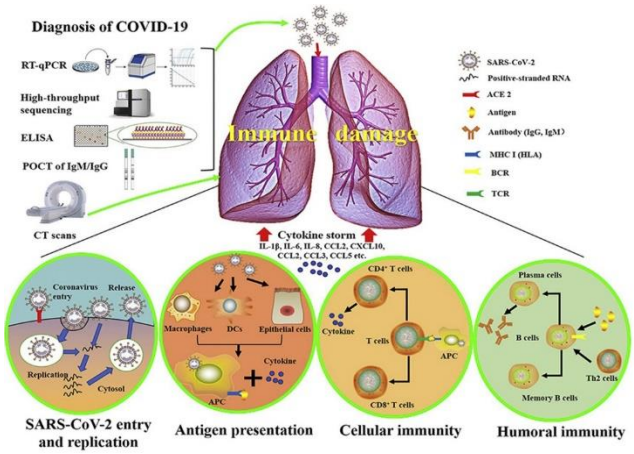


Figure 8: Diagnosis of Covid-19

CURRENT TREATMENT STRATEGIES FOR COVID-19 [16,17,2]

- Virally targeted inhibitors
- Antibody and plasma therapy
- Oseltamivir, a neurominidase inhibitor, is as of now being utilized by clinical staff in China for associated diseases notwithstanding the need with any decisive proof in regards to its viability on COVID-19.
- Chinese rules do prescribe momentary treatment with low-to-direct portion corticosteroids in COVID-19 ARDS.
- Antiviral medications, for example, ribavirin, lopinavirritonavir have been utilized dependent on the involvement in SARS and MERS.

- There is recounted involvement in utilization of remdeswir, an expansive range hostile to RNA sedate produced for Ebola in the board of COVID-19.
- Other drugs proposed for treatment are arbidol (an antiviral medication accessible in Russia and China), intravenous immunoglobulin, interferons, chloroquine and plasma of patients recouped from COVID-19.
- The antiviral action of chloroquine and HCQ have been distinguished in the in vitro investigations and the development of a wide range of infections have been hindered in the cell culture line by both the operators, including the SARS coronavirus.

CONCLUSION

The episode of the COVID-19 has become a clinical risk of everybody and medicinal services laborers around the world. Be that as it may, information about this novel infection stays restricted. The viable choice of antiviral treatment and immunization are right now under assessment and advancement. What we can do now is forcefully execute disease control measures to forestall the spread of the SARS-CoV-2 by means of human-to-human transmission. General wellbeing specialists should continue observing the circumstance, as the more we find out about this novel infection and its related episodes, the better we can react.

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