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The Corona Virus: Applied safety measures in Optometry Practice

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Abstract

The outbreak of Coronavirus (COVID-19) is a pandemic word widely. The concern of this article is with the optometric practice, which is a well-established branch of Ophthalmology. The important aim is to do work with the patients full of safety. The specific reason is there is no exact treatment for this disease. Ophthalmic patients are generally observed at a closer distance, so the use of instruments and practice goes at higher risk. To prevent the observer from the coronavirus risk, some of the procedures and their techniques should be under care in different ways. The communication with patients and their attendant, Co-worker, and equipment are handled in a way to avoid transmission is very necessary.

Keyword: Coronavirus, COVID-19, DNA, MERS, Pandemic, RNA, Sanitization, SARS, WHO.

Introduction

In the current scenario potential of COVID-19, the Novel Corona Virus spread is going in the form of a pandemic word widely to crate very serious risk for public health.

In India, the beginning of transmission is migrated from China and reported on 30 January 2020. Till the date of April 21, 2020, the Ministry of Health and Family Welfare has confirmed a total of 18,601 cases, among them, 3,252 recoveries (including 1 migration) and 590 deaths in the country are reported.[1]

The effort to break the sequence of transmission of disease a 14th hour's voluntary public curfew at the instance of the Prime Minister Mr. Narendra Modi of India announced on 22 March 2020. Thus the decision was taken for lockdown in the cities of 75 districts, suspected for the outbreak of COVID patients. [2,3] In the same sequence a nationwide lockdown for the 1.3 billion population of India, on 24 march has announced by the prime minister for 21 days.[4, 5] On 14 April, the prime minister extended the ongoing nationwide lockdown till 3 May. [6]

What is Virus..?

The virus word is arrived from the Latin to define it as poison or toxic liquids. It is also defined as a poison in Sanskrit viṣa, Avestan vīša, and in Greek ἰός too. [7, 8] Morphologically a Virus is a sub-microscopic infectious agent that replicates only inside the living cells of an organism. Viruses can infect all types of life forms, from animals and plants to microorganisms including bacteria. [9]

Till the time about 5,000 virus species have been described in detail,[10] of the millions of types of viruses in the environment.[11] Viruses are found in almost every ecosystem on Earth and are the most numerous type of biological entity.[12, 13] The study of viruses is known as virology, a sub-specialty of microbiology.

The independent unit of the virus is known as Virion and consists of:

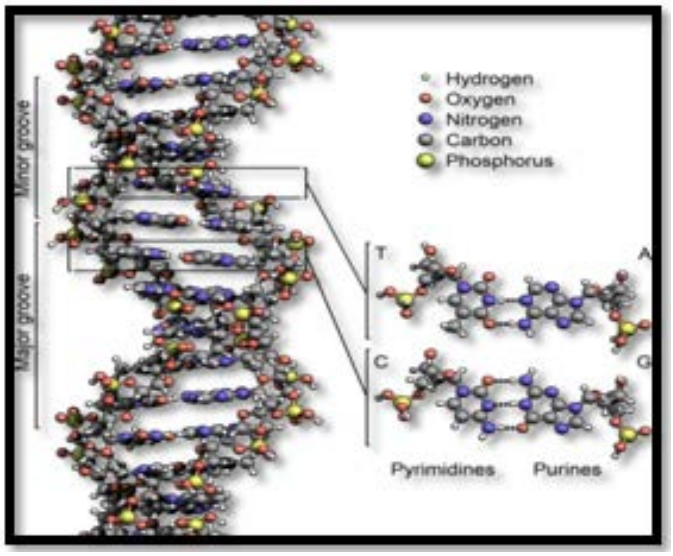

Figure 1: DNA [14]

1) The genetic material; comprise of DNA or RNA strands that encode protein structure. The property of the virus depends on it.

The Deoxyribonucleic Acid (DNA) and Ribonucleic Acid

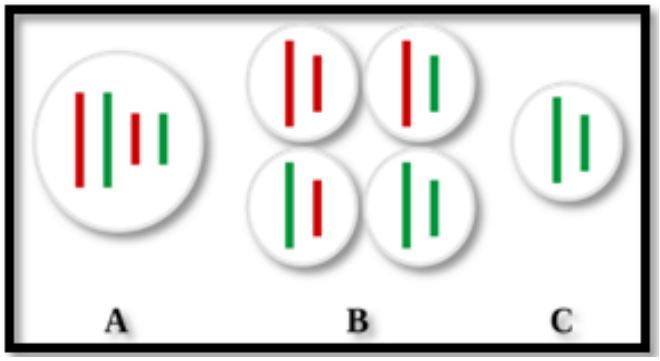

Figure 2 : Somatic Cell [14]

(RNA) are nucleic acids. The DNA molecule consists of paired polynucleotide chains in a fashion of coil to form a double helix to carry all the genetic instructions like growth, development, function, and reproduction.(fig-1,2)

Alongside proteins, lipids, and complex carbohydrates (polysaccharides), nucleic acids are one of the four major types of macromolecules, Adenine, Cytosine, Guanine, and Thymine that are essential for all known forms of life. [14]

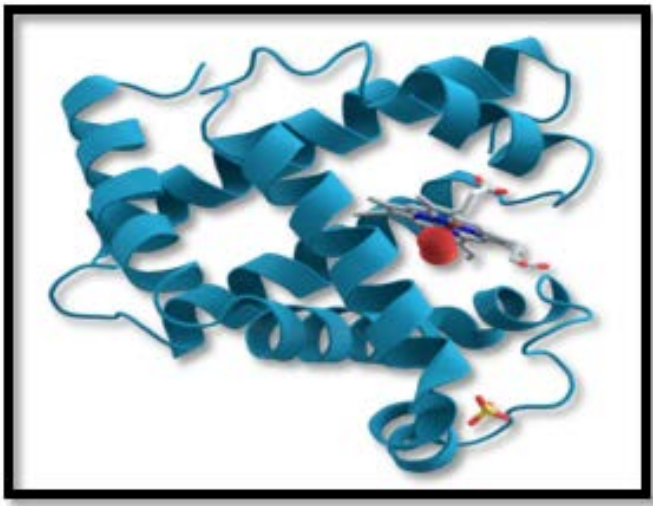

Figure 3: Protein [14]

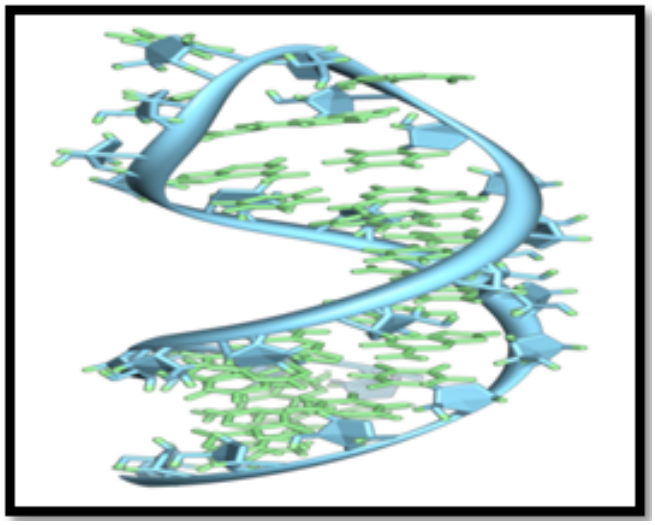

Figure 4: RNA [14]

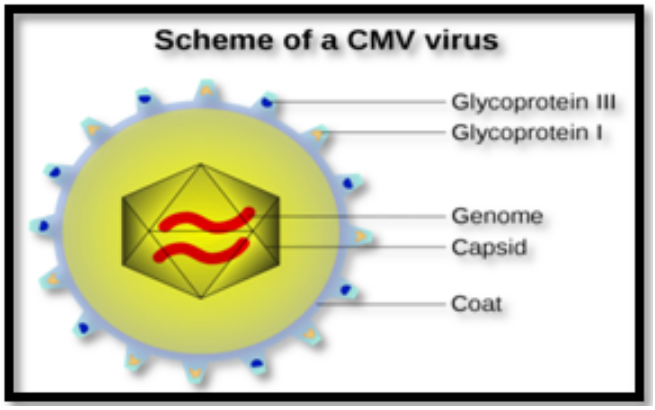

Figure 5: Capsid [14]

In molecular biology and genetics, a genome is the genetic material of an organism. It consists of DNA. The genome includes the genes and the non-coding DNA, as well as mitochondrial DNA and chloroplast DNA (plants). [14]

The study of the genome is called genomics. (A)- Somatic cell. (B)- Possible combinations of both parental (red and green) chromosomes. (C)- Gametes of a hybridogenetic hybrid contain the genome of one parental species. (fig-3) [14]

Capsid is an outer coat of the genetic material and made up of protein. Such proteins are made up of either one or more long chain of amino acids, in the form of bio or macromolecules, and are responsible for various functions as a catalyst for metabolic reactions, DNA replication, cell structure, etc. The property of proteins based on the sequence of amino acids which is further based on a sequence of nucleotides. (fig-4) [14]

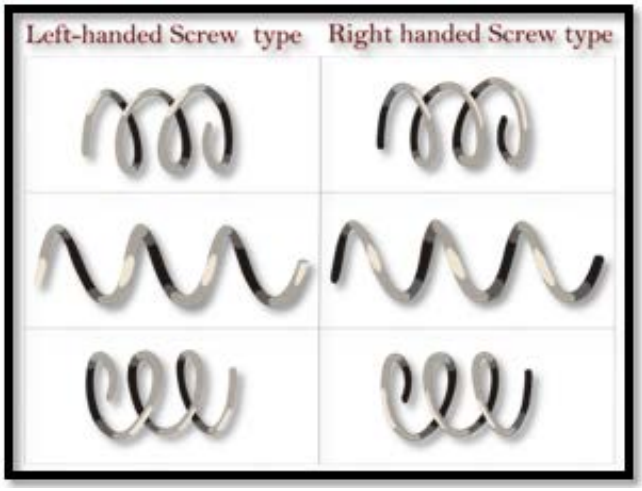

Figure 6: Helical Forms [14]

Protomers are the subunits of Oligomeric structure made up of proteins. Capsomers are the morphologically 3-D units that may have or not either type of protein. (As an example of cytomegalovirus figure) [14]

2) An outside envelope of lipids. A virus has the shape either of a simple helical, icosahedral (more complex structure). Various Virions have their smaller size as one-hundredth of the bacteria and could be observed only by Optical Microscope.

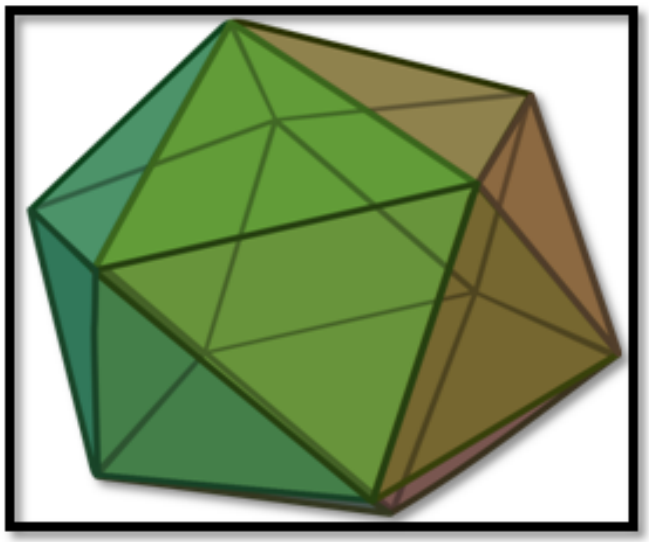

Figure 7: Icosahedron Form [14]

The two types of helix comparisons are shown in the figure. This shows the two chiralities of helices. One is left-handed and the other is right-handed, showing the difference in their morphology. The chirality is a property of the object, not of the perspective (view-angle) [14]

Icosahedrons, (Ancient Greek εἴκοσι (eíkosi), meaning 'twenty', and ἕδρα (hédra), meaning 'seat') is a polyhedron having 20 faces of geometry. So the various shapes in the different patterns are there and among them some of identically closer. [14]

General Consideration Of Viral Spread

Viruses spread in many ways. Vectors are the medium through which transmission occurs. 'Host range' is the verity of the host cell on which virus infects. If it affects on few species then it called a narrow host range and if it affects many species then called broad host range.

The plant viruses are often transmitted from plant to plant by insects and viruses in animals carried by various routes as Influenza viruses are spread by coughing and sneezing. The viral gastroenteritis caused by Norovirus and rotavirus. They are transmitted by the fecal-oral route. HIV is transmitted through sexual contact and blood vascular system.

Viral infections in animals aggravate an immune response. Immune responses can also be produced by vaccines, which confer an artificially acquired immunity to the specific viral infection.[15]

Corona Virus

The name "coronavirus" is derived from Latin corona, meaning "crown" or "wreath", itself a borrowing from Greek Corona Korone "garland, wreath".[20, 21] The name was first used in 1968 by the virologists to designate it as the new family of virus. [19, 22]

Etiology

A Coronavirus is a group of related viruses that affects mammals and birds. In humans, it causes mild to a lethal range of respiratory tract infections. Mild infection includes cases of the common cold, while a lethal range of infection causes SARS, MERS, and COVID-19.

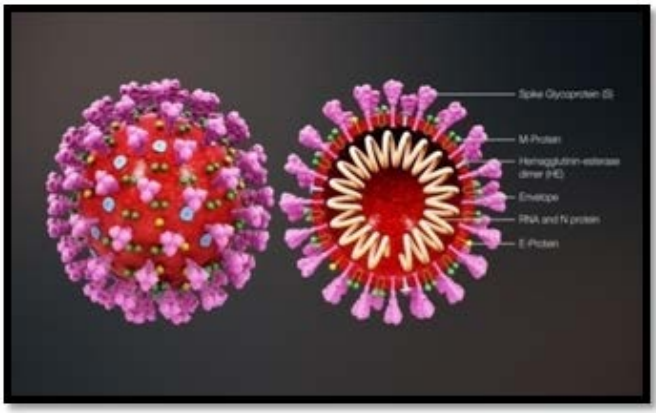

Figure 8: Corona Virus [32]

Coronaviruses is the member of Coronaviridae family, its subfamily is Ortho-coronavirinae, order Nidovirales, and realm is Riboviria.[16,17]

They need enveloped viruses with a positive-sense single-stranded RNA genome and a nucleocapsid of helical symmetry. Coronaviruse is a RNA virus and its genome size is about 26-32 kilo bases.[18] Its structural characteristic is club-shaped spikes that project from their surface and on electro micrographs, it creates a picture looking like to the solar corona from which their name derives.[19]

A total of seven species of corona virus has been identified up to the time. Nevertheless one is the copy of the previous one with the difference of strains. The first four types of coronaviruses produce the symptoms of cold and fever in adults and kids world widely. The remaining last three produces very serious symptoms: [23, 24, 25, 26, 27, 28]

Name of seven human coronaviruses:

Human Corona Viruses	
Mild Symptoms	**Potentially Severe Symptoms**
1.OC43 (HCoV-OC43), β-CoV	5.Middle East respiratory syndrome (MERS-CoV), β-CoV
2. HKU1 (HCoV-HKU1), β-CoV	6.Severe acute respiratory syndrome (SARS-CoV), β-CoV
3. 229E (HCoV-229E), α-CoV	7.Severe acute respiratory syndrome 2 (SARS-CoV-2), β-CoV
4.NL63 (HCoV-NL63), α-CoV	

Coronavirus disease (COVID-19) is a communicable disease whose outbreak began in Wuhan, China, that is a new strain and was discovered in 2019 and has not been previously identified in humans. Coronaviruses are viruses that can cause illness in both animals and humans. In humans, several coronaviruses are known to cause respiratory infections starting from respiratory disease to more severe diseases like Middle East Respiratory Syndrome (MERS) and Severe Acute Respiratory Syndrome (SARS).[29]

Most of the people, who get infected with the COVID-19 virus if treated for their symptoms, are recovered well without any special treatment. The patient with systemic illness and immune-compromised patients are more likely to develop serious illness. [29]

Transmission

The COVID-19 virus spreads primarily through aerosol as small droplets from the nose or mouth expel out during cough and sneezing and these droplets land on objects and surfaces around the normal person, this way People can catch COVID-19 by touching these objects or surfaces and further touching their eyes (tears and discharge), nose or mouth. So this is important to block the spread of disease stay quite more than 1 meter (3 feet) away from the affected person. People of all ages may be infected by the new coronavirus (2019-nCoV). The patient with a systemic illness like hypertension, diabetes, and immune-compromised patients are more likely to develop serious illness. [30]

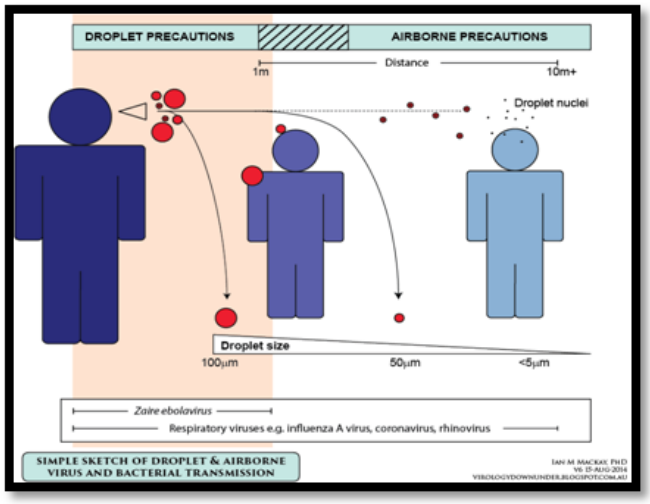

Figure 9: Aerosol Transmissions [33]

The main mechanism of animal-to-human transmission in initial cases of the CoVID-19 disease was assumed to direct exposure to the Huanan Seafood Wholesale Market of Wuhan; nevertheless, consecutive cases were not suggested to this exposure mechanism. Therefore, it had been concluded that the virus could even be transmitted from human-to-human, and symptomatic people are the foremost frequent source of COVID-19 spread. The chance of transmission before developing the symptoms seems to be infrequent, although it can't be excluded. Moreover, the individuals who remain asymptomatic could transmit the virus. This data suggests that isolation is the best remedy for resolving the issue.

Aerosol transmission is additionally possible just in case of protracted exposure to elevated aerosol concentrations in closed spaces. Analysis of information associated with the spread of SARS-CoV-2

in China seems to point that close contact between individuals is critical. The spread is primarily limited in between the members of the family, healthcare professionals, and other close contacts.

About the incubation time, the study supported data from the initial cases in Wuhan and investigations conducted by the China CDC (centers for disease control) and native CDCs, According to one study, the incubation time approximately concluded 3 to 7 days to 2 weeks because of the symptoms arrises in 12.5 days in infected peoples (95% CI, 9.2 to 18). [31]

Symptoms

The most prevalent symptoms of COVID-19 disease are fever, tiredness, and dry cough. Some patients may have aches and pains, nasal congestion, runny nose, sore throat or diarrhea, red eyes, sometimes with pain, tearing, discharge, and diminishing of vision. These symptoms are usually mild and start gradually. In the total infected peoples, some don't develop any symptoms of the disease while some develop more severe types of symptoms. The general public (about 80%) lives through the disease while not having special treatment. The younger and the older people underlying medical problems like raising blood pressure, heart problems, and diabetes, are more likely to develop serious illness. People with fever, cough, and difficulty breathing should seek medical attention. [29]

Sign

The clinical spectrum of COVID-19 varies from asymptomatic forms to clinical conditions characterized by respiratory failure that needs mechanical ventilation with support of an intensive care unit (ICU), to take care of multi-organ and systemic manifestations in terms of sepsis, septic shock, and multiple organ dysfunction syndromes (MODS). Huang et al. concluded in their study regarding coronavirus, the patients (n=41) who suffered from fever, malaise, dry cough, and dyspnea, their Chest CT scans showed pneumonia with abnormal findings in altogether cases. [34]

About eye, Kerato-conjunctivitis is the initial medical presentation of the novel coronavirus disease 2019, although presentation varied from one examination to the next. In the beginning clear watery discharge, sore and swollen eyelid, mucous discharge with corneal epithelial defects spread diffusely over the entire cornea. The preauricular lymph node involvement also noted in the post phase. [35]

Prevention

The first fundamental is protecting yourself and others around us by knowing the facts and taking appropriate precautions. To prevent the spread of COVID-19: hands should be cleaned often. The soap and water or an alcohol-based hand rub should be used frequently. Compulsorily safe distance from anyone should be Maintain with the person who is coughing or sneezing. It's also important to practice respiratory etiquette (by coughing into a flexed elbow). Don't try to touch eyes, nose, or mouth. Stay at home is much better if the feeling is unwell. Local health authorities' directions should be following if there is a fever, a cough, and difficulty in breathing. Avoid unnecessary visits to medical facilities. The counselor should wear Face Shield, Mask, and Gloves and counseling to be done in a well-ventilated room. The proper record should be registered of the patient, attendant, and the counselor who attending the patient for possible contact tracing.

If the patient has a high temperature, then directly should be referred to the local COVID Centre otherwise if the patient has a complaint about red-eye then under complete safety, should be observed for conjunctivitis or foreign body, if it is not then vision or refraction

with spectacle correction and appropriate medication should be prescribed.

The care against the exposure to bodily fluids (including respiratory or eye secretions) should be taken through wearing a gown, gloves, and face mask covering the mouth and nose, and eye shield/goggles (Personal Protection Equipments-PPE). [36, 37] Use ear buds to touch eyelids & discard after use Outer gloves discarded after each patient if visibly soiled. If gloves not soiled, use alcohol hand rub and allow drying. Not to ask for any assistance like in holding a patient's head on Slit-lamp, instead, ask the attendee to do so. Avoid unnecessary conversation with the patient while examining them. Slit lamps should be equipped with a breath protector using acrylic sheets. Moreover, the equipment installed in the examination room should be disinfected before and after their use.

To reduce the gathering of people, patients in OPD should be asked to come into the visiting room without an accompanying person. Also, students and fellows should not be allowed to attend the clinic. [38]

The disinfection and another safety measure for the instrument should be taken as follow-

1. Slit-Lamp after every patient with 70% alcohol or equivalent.
2. NCT not to be used as there is a concern about generating aerosols. So the use of Tonopen or I-Care Tonometer is preferable, an applanation tonometer can be used. In Tonopen change off tip cover for every patient. The handle of Tonopen and tip should be disinfected with isopropyl alcohol swab of 70% and allowed to dry in room air for 30 seconds. Applanation Tonometer Prism wiped with isopropyl alcohol swab of 70%air dried for 3 minutes. End of the day, the prism can be soaked in 1% sodium hypochlorite for 3 minutes.[42]
3. Lensometer should be wiped with 70% isopropyl alcohol. [42]
4. UBM shell and probe washed with distilled water after use (avoid alcohol or sodium hypochlorite which may damage the probe) [42]
5. ERG: If Burian Allen electrodes used, use soap and water for at least 40 seconds. [42]
6. Contact Lens: Avoid trial with RGP or Scleral Lenses. For soft lens trial, disposable lenses should be used. [42]
7. +20D, +78D, +90D, Gonio, and Laser lenses should be clean thoroughly with soap and water daily. Spray Isopropyl alcohol (99.9%) after use. Allow lenses to air dry before replacing them within the case. [42]
8. Trial frame and rim of trial lenses wiped with 70% isopropyl alcohol. Alternatively, a trial frame must be soaked in disinfectant like 1% sodium hypochlorite for 10 minutes between each patient. [42]
9. Chinrest, forehead rest, handles, table, and surface touched by the patient should be cleaned with 70% isopropyl alcohol and permit them to dry before observing the next patient. [42]
10. The computer’s keyboard and monitor should be wiped with a tissue soaked in isopropyl alcohol, and taking care of the moisture should not be entering them. [42]
11. The external body of the equipment should be wiped with 70% alcohol or Lizol may be used. Wipe leaving lens cover. [42]
12. Visual field analyzer Trigger/buzzer held by patient and occluder used on the face to cover the eye should be cleaned with 70% alcohol. The Bowl of the perimeter can’t be disinfected. It is wiped with a soft cloth/tissue. Hence wearing a patient mask is

mandatory. Allow 20-30 minutes between patients. Keep the door open. Defer repeat test within the same visit just in case the patient is unable to confirm reliable readings. [42]

13. The objective lens area of OCT /LASER should be Cover with cling wrap .45 gauges Polyolefin or POE cling wrap (cross-linked or non-cross linked) should be used, as this provides high strength and clarity. Clean the cling wrap with 70% isopropyl alcohol after each use. [42]
14. Corneal Topography: Protocol the same as to Visual Field Analyzer. [42]
15. FFA To be done only in on serious necessity. Appropriate precautions as just in case invasive procedures to be taken while injecting the dye. The body may be wiped with 70% alcohol & the lens is also cleaned with 99.9% isopropyl alcohol. One attendant with the Patient should be permitted under the condition for both to wear a mask. [42]

Medication

Antibiotics only work on bacterial infections, so they could not be used as a method of prevention or treatment of Virus COVID-19. Unfortunately, there is no specific vaccine and antiviral medicine recommended to check or treat the new coronavirus (2019-nCoV). The pneumococcal vaccine and Haemophilus influenza type B (Hib) vaccine, do not protect against the new coronavirus too. However, antibiotics should be used to relieve symptoms. People with serious illnesses should be hospitalized and most of the patients recover due to supportive care. [29]

This virus is so new and different that it needs its vaccine, although researchers develop a vaccine against 2019-nCoV, in support of WHO. [29] In Rajasthan, a trial of the combined drugs anti-malaria, anti-Swine flu, and anti-HIV are used together to recover three patients in March 2020.[39] At the identical time, an effort for developing the vaccine for the treatment of coronavirus is made by the Cipla Corporation in correlation with the Council of Scientific and Industrial Research and Indian Institute of Chemical Technology. [40] The Stempeutics; Indian firm also made efforts to introduce a stem-based agent for treating coronavirus patients.[41]

Regarding Ophthalmic medication oral antiviral valacyclovir, 500 mg (PO TID), and antibiotic moxifloxacin, 1 drop (QID) supported a presumed diagnosis of herpetic kerato-conjunctivitis in pre-phase of disease. [35]

Myth About Covid - 19

Some of the interesting misconceptions regarding disease are publicized.

1. Thermal scanners are effective in detecting such persons who have developed a fever; however, the thermal scanner can’t detect infected people with the new coronavirus.
2. Viruses cannot travel on radio waves/mobile networks.
3. COVID-19 virus transmits in all areas, either hot, cold, and humid weather besides its weather condition can not kill the new coronavirus.
4. Taking a hot bath wouldn’t counter from catching COVID-19. A very plight bath can burn skin.
5. Hand dryers are seriously not effective in killing the 2019-nCoV.
6. The new coronavirus couldn’t be transmitted by mosquitoes.
7. Hand sterilization with UV lamps isn’t ideal for the sanitization because of skin irritation.
8. The impact of Coronavirus in various people may resolve if the developed symptoms are treated ideally.

9. The ability to hold the breath for 10 seconds or more without coughing or feeling discomfort does not mean that the individual is free from the coronavirus disease (COVID-19).
10. Frequent or excessive alcohol consumption can increase your risk of health problems.
11. Alcohol or chlorine sprays over the body will not sanitize, nevertheless, it causes harm to clothes and mucous membranes of eyes, mouth, and nose.
12. Regular rinsing of the nose with saline is not the evidence to guard people against infection with the new coronavirus. However, regular rinsing of the nose with saline has not been shown to stop respiratory tract infection, besides some chances of a quick recovery are there.
13. Garlic is a good healthy food having some antimicrobial properties but no evidence is there that eating garlic has protected people from the present outbreak of a COVID-19.[30]

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