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COVID-19: A Pandemic Virus: Treatment and Management 2020

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Abstract

COVID-19 is an RNA virus which caused a pandemic in 2020. This account clarifies what a virus the COVID-19 virus is, clarifies how the virus spreads, appraises existing therapeutic modalities, and lays out accepted strategies for social behavior, constraint of the virus and selection for quarantine during the pandemic.

Background and Introduction: Therapeutic modalities over the past century embraced three broad vistas, namely Psychological, Surgical and Medical management. Mental health, diagnosis treatment and therapy have replaced superstition, prayer and vapid religious ritual. With invasive surgical procedures, virtual elimination of pain is taken for granted, operative modalities are modernized, and recovery times and convalescence has been drastically reduced. In medicine, most people have grasped how well the possibility of infection is constrained, controlled and minimized. Thanks to the Internet, main-stream and social media, the vast majority of the global population seems to understand the huge expansion of biomedical progress made over the past hundred years. Yet when it comes to viral infections with a distinct probability of causing a pandemic, like the influenza pandemic of 1918, there seems to be an innate resistance to comprehending the full extent, influence, dangers morbidity and mortality, that such a novel virus can inflict on global groups whether small confined communities or populous crowded populations. The classic example of this is the COVID-19 pandemic currently (2020) affecting people throughout the globe. When the COVID-19 virus first struck people in February 2020, health care workers knew little about its' origin, effects and therapy. From global reports, clinical managements and sharp intense observation, more is known now [Sept 2020] about its' pathogenesis and treatment modalities. Consequently, morbidity has reduced and chances of survival have improved significantly.

Aim: The purpose of this subjective appraisal is to summarize current (2020) approaches and protocols to COVID management which moderate, constrain, minimize or modify the infection.

Keywords: COVID-19; Epidemic; Infection; Therapy; Pandemic; Prophylaxis; Virus

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COVID-19

In December 2019, an outbreak of severe acute respiratory syndrome coronavirus-2 infections was reported in Wuhan, Hubei Province, China. The virus spread out across the world, and was the cause of a subsequent global pandemic in 2020., On February 12th, 2020, the World Health Organization announced and named the infection caused by this new coronavirus as "Coronavirus Disease 2019 (COVID-19)" Most affected cases with COVID-19 had a pneumonia with typical CT imaging patterns and characteristic radiographic features. The virus was presumed to selectively attack the lungs, but subsequent research showed that it has a predilection for reticulated capillary networks. This virus is an RNA Corona virus, whose name derives from its' appearance under a scanning electron microscope, and uses RNA to invade cells, hijack their RNA reproductive system, and attacks the hosts immune system facilitating release of cytokines, all of which contribute to the clinical effects of being infected with this virus.

Current Clinical Protocols and Strategies

COVID-19 mortality was initially deemed to be deadly from inducing lung infections. Mortality from a terminal pneumonia focused attention on methods to improve affected sufferers' breathing by increasing their oxygenation with Ventilator machines. Subsequently health care workers understood the COVID-19 virus was causing blood clots in reticulated capillary blood vessels, with concomitant reduction of oxygen and dysfunctional metabolism. This anoxia could affect any organ, but that the lungs are particularly vulnerable and develop pneumonia. Increased oxygen flow

from ventilators has proved less than ideal, and focus is now directed at preventing blood coagulation by dissolving capillary blood-clot formation. Consequently, anti-coagulant drugs like Aspirin and Heparin (which are 'blood thinners' that affect blood platelets to prevent spontaneous clotting) are prescribed as support pharmaco-therapy in treatment regimens to constrain morbidity in all organs, especially the lungs.

Anoxia

Low oxygen levels in the body are called 'Anoxia'. At levels of 90% patients usually manifest symptoms like breathlessness and difficulty in breathing. With COVID-19 infection, the blood clotting mechanism slowly aggravates, progressively diminishing oxygen diffusion and produces anoxia. Sudden unexpected mortality in the brain from anoxia, may occur with COVID infection that reduces oxygen levels to as low as 70% before symptoms manifest. The status during oxygen reduction is referred to as "Happy Hypoxia" where even though the oxygen saturation is slowly reduced, the COVID-19 patients don't show symptoms until they reach 70% oxygen saturation, at which time they are very ill. Consequently, without symptoms like breathlessness, infected COVID sufferers only seek help at advanced stages of the disease. Accordingly monitoring oxygen saturation is important, and vigilance is necessary with oxygen saturation close to-, or below 95%. At 93% oxygen saturation, expedited referral to hospitalization is critical, and patients need to be put on Ventilators. For patients quarantining them at home, pulse oximeters may be used to monitor oxygen levels to provide early readings of change; early placement onto ventilators allows health care workers the opportunity to raise oxygen levels early and this will reduce prevalence of mortality.

Drugs

Initially most doctors deemed that there were no drugs to counter the COVID-19 virus. Treatment was directed at pulmonary infections with antibiotics deriving from lung complications caused by the hypoxia. Consequently, many patients suffered with severe complications of bacterial pneumonia. Yet before the COVID pandemic, anti-viral drug therapy was developed and used to treat AIDS, also caused by a virus, the Human Immuno-Deficiency Virus. From the HIV/AIDS pharmacological armamentarium, there are two drugs, namely: Favipiravir and Remdisivir, both of which are virucidal to COVID-19. These drugs constrain COVID-19 growth and proliferation and prevent severe pulmonary infections from bacteria. Rationally, any drug reducing inflammation or constraining the immune reaction should have an effect on COVID-19 induced immune-inflammatory reactions. Fortuitously it is known that corticosteroids do precisely that namely reduces inflammation and moderate's onset of immunity. Steroids have been in use for decades, and successfully attenuate the cytokine storm in COVID-19 patients, and help significantly in keeping complicating mortality and morbidity low. Colchicine reduces the inflammation from COVID-19. In gout disorders of purine and pyrimidine metabolism produces a hyperuricemia and precipitation of uric acid crystal around joints. Urate tophi because joint inflammation accompanied by severe pain. The inflammation and pain are assuaged by colchicine which inhibits migration and agglomeration of white blood cells, granulocytes and mitosis. Colchicine has a similar action on tissues and organs affected by COVID-19 and reduce the inflammation and accumulation of granulocytes, and cuts down the circulating cytokines from the virus.

Virus Infections

Virus infections cause inflammation of vital tissues. Inflammation affects the release of cellular components, among which is the major molecule histamine, and other inflammatory molecules (like IL-6, TNFα, IL-8), referred to as cytokines. The body's protective mechanisms also produce cytokines as part of its' cellular- and humoral-immune system. COVID-19 itself activates the immune system and invokes release of cytokines. This exaggerated flood of immuno-inflammatory molecules is called a 'Cytokine storm', and is not only responsible for moderating viral growth, but also overwhelms all the body's' defenses, and precipitates death.

Active and Passive Immunity

Survivors of COVID-19 infection develop an active immunity (whether cellular, humoral or both is currently uncertain) against the virus. They do develop immunoglobulin antibodies which circulate in their plasma. Whole blood from these survivors is drawn, the cellular contents (erythrocytes, leukocytes and platelets) are removed and the residual antibody containing plasma is administered to COVID-19 sufferers, to moderate against serious complications. This therapy slows down the progress of complications and maximizes the chances of recovery. Vulnerable groups, like diabetic and immune-compromised oncology patients, benefit greatly from this passive immunity treatment.

Chloroquine/Hydroxychloroquin and COVID-19

The idea of chloroquine/hydroxychloroquine as an antiviral in not new. Substantiating use of this drug derives from 4 properties, namely they both inhibit (1) pH-dependent steps of viral replication of several viruses including coronaviruses, (2) they suppress IL-6 and TNFα production which molecules act as an immune-suppressor, (3) they slow autophagy by impairing autophagosome-to-lysosome fusion and (4) inhibit p38 MAPK activation. These actions will influence most viral reproduction, but clinical trials have not shown consistently and conclusively that these anti-malarial drugs strongly affect the action of COVID-19. Some moderating affects slow the morbidity, but it is not an absolute cure as antibiotics are with susceptible bacteria.

Psychological Support

COVID-19 infected patients experience all the phases of being serious ill. They start with denial and the progress through, anger, depression, bargaining and finally acceptance. Care givers can make a difference in the lives of families affected by listening to them, understanding their backgrounds, and empathetically discussing their values. The goals of care are to explain the set-up, involve patient and family in the decision-making processes about quarantine, PPE, social distancing and treatment of complications. Together and with the medical team, to hope for the best, but preparing for the worst that COVID-19 could bring.

Morbidity and Mortality

Early on, most infected people develop a loss of smell and a modification of taste sensation, but this is not reliable as an indicator for infection. A viremia may produce lethargy, muscle and joint pain, headaches of other mild bodily aches and pains. The person at this infective stage may show minor or no symptoms, but are infective and transmit viable virions through their breathing, coughing sneezing or

even talking or singing. All organs with reticulated capillary networks may be afflicted, and those affected can produce unusual symptoms. For example, a small clot on the brain may render symptoms of a cerebrovascular accident, with signs and symptoms varying from minor headaches and paresthesia, to motor in coordination, numbness of limbs and/or stroke. Serious morbidity complications are significant, but are rare, and not worse than a serious bout of uncomplicated influenza. Most diagnosed cases are quarantined at home for three weeks, during which time a full recovery is expected. Survival rates among healthy people without predisposing medical conditions, like diabetes, or other immune-compromised states, is high, with mortality rates being below 5%. Full recovery can be 99% depending on the health of the individual, their immune status, proper management and availability of support equipment for serious complications.

Posture

Most patients, sick in bed and affected by COVID-19 lie supine that is face-up on their backs. In this position pulmonary exudates and inflammatory fluid tend to accumulate in the posterior regions of the lungs, and this limits oxygen exchange and the ability for the lungs to cope with inflammatory exudates. By having the patient change posture, those with hypoxia will improve by making them lying prone that is lying down on their stomachs, and forcefully breathing a few breaths. This redistributes any liquid accumulation and allows for better aeration and increased oxygen exchange in all alveoli in the whole lung.

Personal Protective Equipment (PPE)

Medical health workers and all support staff are on the frontlines to be infected with COVID-19. Infected people seeking help flee to hospitals, clinics and treatment centers providing specialist medical advice and help. Consequently, all Medical Health Care Workers (MHCW) are prime targets for acquiring COVID-19 infection from carriers, and they should be adequately provided with Personal Protective Equipment (PPE), to minimize infection. Disposable oro-nasal masks, gloves, protective eye-ware, impervious facial screens, gowns, and body coverings (head and feet) are mandatory. Health Institutions should have disinfecting air-condition filters, maintain high levels of asepsis, and place Ultra-Violet lights in situ, keeping them switched-on when public traffic is not present. Testing daily if possible is essential for this cohort, and any positive individual must be quarantined for at least three weeks to recover.

Control and Spread and Infectivity

There is no doubt that spread of COVID-19 is mediated through the virus being transmitted through aerosol droplet spread and/or by transmission of viable virions on infected fomites on surfaces. Disinfectants and filtered air conditioning will minimize virion infection from breathing and other aerosol spread.

This in combination with impervious face screens and masks covering the oro-nasal orifices, are effective as at virtually eliminating all virion infection. Frequent washing hands effectively with disinfectant soap, and hand sanitizers will stop tactile transmission of viruses.

Social Distancing

A cough or a sneeze can project an aerosol spray of droplets at least 1.5 meters from the source into the surrounding air. Accordingly, people in public or confined spaces should place about 2 meters of space between them. This social distancing ensures minimal chances of picking up an infection from a viral carrier. Close physical intimacy should be strictly reserved for immediate family, preferably those who have been tested negative for COVID, like mothers with babies or children, and bonded couples.

Greetings and Farewells: Kissing, Hugging, and Embracing

These customs for greeting and farewell must be strictly avoided. Any close contact with kissing, hugging or embracing will facilitate transfer of infection. Other viruses like Human Papilloma and Hepatitis Viruses, will spread with equal ease of transmission with these social behaviors. New modes of expressing welcome like bowing, or approximating your own two palms in front of the face, are safer and desirable.

Vaccines

Vaccines, mutations or inducting derivatives may act as antigens when introduced into the body. This (a viable vaccine) would be ideal and effective at ending the COVID-19 Pandemic. The resulting active immunity reaction will provide antibodies which neutralize the antigen. Because viruses mutate quickly, and most parts of infecting virions may not be antigenic, producing an effective vaccine against any virus is challenging, costly and laborious. An example of difficulty procuring a needed vaccine against a virus is for the HIV/AID virus. But positively reactive vaccines against many other viruses have been successfully developed, and have been therapeutically deployed worldwide. Most notably with remarkably successful outcomes against Small Pox, Polio-Myelitis, Measles, Rubella, and Tetanus among others. From chemical molecular, cellular, animal human and final clinical-trials in double-blinded-crossover studies involving a cohort population of at least 30,000 to 50,000 people, positive evidence must be presented for official approval for prophylaxis. Currently although many biomedical companies are testing potential anti COVID-19 vaccines, no effective approved vaccine exists.

Discussion

It is important to note that although all of the above may moderate the morbidity and mortality of the COVID infection, none of the above is a prophylaxis or a total post-infection cure of the viral disease. The necessity for Social activity is acknowledged, and social organizing to minimize spread and the crush of a second wave of COVID-19 illness depends on testing and weeding out infected persons.

Survivors of COVID-19 infection to be given priority for helping with administration of this. This suggestion follows:

The importance of testing as the vital key to success with protecting, controlling and limiting the Pandemic.

1) The test must be quick (minutes for results), accessible, and affordable.

2) Multiple testing locations to be opened with testing stations on Mondays- and Thursday-Mornings should be ubiquitous and 'normal.'

Results printed out, dated and affirmed as negative will be valid for 48 h only.

3) Staffing to be trained and numerous. Each testing-officer

Figure 1: SpectraLIT.

should be capable of numerous tests per hour. At least 200 tests or more, per day should be feasible.

4) Test positive -> immediate compulsory quarantine. If serious/ symptomatic refer to hospital

5) Test negative -> repeat three times. All negative --> Normal/ usual daily activity.

6) Masks or transparent Plastic Facial Screens (PPE's) available to all. Social distancing is optional. One infected person is one too many.

One example [1] of rapid cheap successful testing is:

Patients rinse with 10 milliliters of a special mouthwash, and then spit into a tube. The sample is placed in a machine that analyzes it, and reports whether it matches the profile of a sample infected with COVID-19. The machine shines light through the sample and onto a special chip. A light source goes thought it, and part of the light is absorbed, and the rest is captured by the sensors. The tube and specially-formulated mouthwash that are given to patients will cost 25 cents. It looks like this (Figure 1).

Concluding Remarks

Until a vaccine becomes available all of society should continue to follow precautions. Three "C" policies apply: Contain: Constrain: Control. When indicated or possible, people should be tested regularly before entering into enclosed crowded places. Wearing masks in public is mandatory; donning an impervious transparent facial screen is better, and practicing social distancing is prudent. Avoid intimate greetings (no contact, hand shaking, kissing, embracing) and farewells for people not in ones' immediate family. Washing hands with an antiseptic soap limits transmission and use of hand- sanitizers ensures no cross infection. Those people who do become infected should be quarantined for three weeks and also receive psychological grieving and social support.

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