

## CORRUPTION OF VITAL INDIGENOUS DISORDER (COVID-19) IN CONGESTIVE HEART FAILURE

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### ABSTRACT

Common human corona viruses, including types 229E, NL63, OC43 and HKU1, usually cause mild to moderate upper-respiratory tract illnesses, like the common cold. Most people get infected with one or more of these viruses at some point in their lives. the most widespread element that was found among covid-19 patient who died has been hypertension and CHF, with at least 55 of them have reported to have suffered from it. those with diabetes are not far behind, with 49 of the patients having reported it. in many cases patient suffered from both these elements hypertension and CHF, why are mostly seen in patients above 40 years of age. our body is depended in in oxygen, but coronavirus effect on our lungs and shows

1. Middle East respiratory syndrome-related coronavirus (MERS-CoV),  $\beta$ -CoV

2. Severe acute respiratory syndrome coronavirus (SARS-CoV),  $\beta$ -CoV

3. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2),  $\beta$ -CoV

due to effect on our respiratory system, silent hypoxia is created form these viruses. hypoxia is directly related to ARDS and myocardial infarction. this both are directly related with cardiac heart failure. the preventive measurement of heart patient due to this covid-19 pandemic is maintained by selfcare. a proper medication is related for heart disease and Covid-19 Patients.

**KEYWORDS:** Pandemic, upper-respiratory tract, hypertension, hypoxia. ARDS, myocardial infarction.

### INTRODUCTION

Lung injury and acute respiratory distress syndrome have taken center stage as the most dreaded complications of COVID-19, the disease caused by the new coronavirus, SARS-CoV-2. But heart damage has recently emerged as yet another grim outcome in the virus's repertoire of

possible complications. COVID-19 is a spectrum disease, spanning the gamut from barely symptomatic infection to critical illness. Reassuringly, for the large majority of individuals infected with the new coronavirus, the ailment remains in the mild-to-moderate range.



**Figure 1: Coronavirus spikes.**

Yet, a number of those infected develop heart-related problems either out of the blue or as a complication of preexisting cardiac disease. A report from the early days

of the epidemic described the extent of cardiac injury among 41 patients hospitalized with COVID-19 in Wuhan, China: Five, or 12 percent, had signs of

cardiovascular damage. These patients had both elevated levels of cardiac troponin — a protein released in the blood by the injured heart muscle — and abnormalities on electrocardiograms and heart ultrasounds. Since then, other reports have affirmed that cardiac injury can be part of coronavirus-induced harm. Moreover, some reports detail clinical scenarios in which patients initial symptoms were cardiovascular rather than respiratory in nature.<sup>[1]</sup>

**Major Risk Factor of Heart during COVID-19:** The basis of contracting the infection is the same for all individuals. The virus is transmitted via droplets in the air from an infected person coughing, sneezing or talking; or through touching contaminated surfaces as the virus can survive for several hours or even days on surfaces such as tables and door handles. Once the virus enters the body it causes direct damage to the lungs and triggers an inflammatory response which places stress on the cardiovascular system in two ways. Firstly, by infecting the lungs the blood oxygen levels drop and secondly, the inflammatory effects of the virus itself cause the blood pressure to drop as well. In such cases, the heart must beat faster and harder to supply oxygen to major organs.

Particularly at risk are the following groups

- Individuals who are immunosuppressed, such as transplant patients, patients with cancer who are receiving chemotherapy or extensive radiotherapy, patients with concomitant leukaemia or lymphoma who have heart disease are theoretically at greatest risk of contracting and succumbing to the effects of the virus.
- Other high-risk groups include elderly and frail people as well as pregnant women with concomitant cardiovascular disease.
- Individuals with heart conditions, such as heart failure, dilated cardiomyopathy, advanced forms of arrhythmogenic right ventricular cardiomyopathy and patients with congenital cyanotic heart disease are at highest risk.
- Patients with the obstructive form of hypertrophic cardiomyopathy may also be placed in the same high-risk category.

There is no evidence that the virus infects implanted devices such as pacemakers and cardioverter-defibrillators or causes infective endocarditis in those with valvular heart disease.

#### COVID-19 relationship with CHF

The new coronavirus is a respiratory disease, meaning it mostly affects the lungs. But when the lungs aren't working at full steam, the heart has to work harder to pump oxygen-rich blood around the body. That added stress can be dangerous for people with heart disease. COVID-19 poses a greater risk to people who have underlying conditions, including:

- Coronary Heart Disease

- Diabetes
- High Blood Pressure. (Higher BP)
- Previous Stroke

People in those groups may be at higher risk of catching COVID-19. They're also more likely to develop severe symptoms if they get sick. Older adults with heart disease may be particularly vulnerable. But if you have heart disease at any age, you should be aware of the possible risks from COVID-19.

#### Relation of COVID-19 With Hypoxia (Oxygen Demand)

Many patients are now arriving at the hospital with oxygen percentage levels in the 80s or 70s and some have even had levels below 50%. The condition is known as 'Silent Hypoxia'.<sup>[2]</sup>



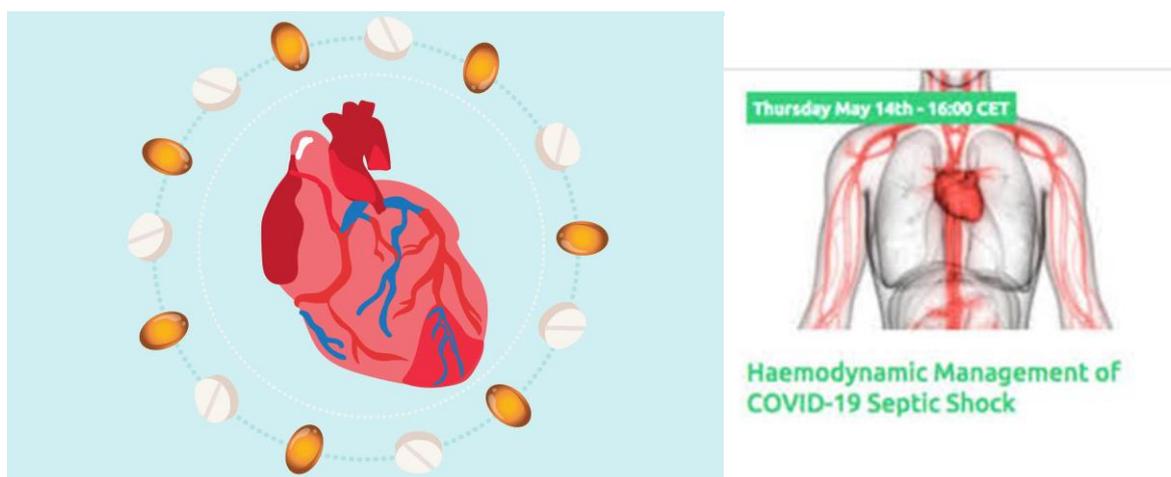
**Figure-2: Viscera of heart Silent Hypoxia.**

It is a condition in which the body's oxygen concentration levels drop below 60% in patients infected with the coronavirus. Hypoxia is a condition in which the body or a region of the body is deprived of adequate oxygen supply at the tissue level. Hypoxia may be classified as either generalized, affecting the whole body, or local, affecting a region of the body. Although hypoxia is often a pathological condition, variations in arterial oxygen concentrations can be part of the normal physiology, for example, during hypoventilation training or strenuous physical exercise. Hypoxia differs from hypoxemia and anoxemia in that hypoxia refers to a state in which oxygen supply is insufficient, whereas hypoxemia and anoxemia refer specifically to states that have low or zero arterial oxygen supply. Hypoxia in which there is complete deprivation of oxygen supply is referred to as anoxia.

**Signs of silent hypoxia and how can it affect those with the coronavirus?** [1] Changes in the color of your skin, ranging from blue to cherry red [2] Confusion [3] Cough [4] Fast heart rate [5] Pain when breathing [6] Low oxygen levels [7] Tight chest rapid breathing [8] Shortness of breath [9] Slow heart rate [10] Sweating [11] Wheezing [11] Other complications.

A recently published *meta-analysis* examined the frequency and symptoms of COVID-19 in humans. These investigators described that among the most common COVID-19 symptoms were fever (82%), cough

(61%), muscle aches/fatigue (36%), dyspnea (26%), headache (12%), sore throat (10%), and gastrointestinal symptoms (9%).



**Figure 3: COVID-19 septic shock.**

In addition to the aforementioned common clinical symptoms of COVID-19, these investigators described detailed chest imaging results. Among those with chest radiologic examinations, the most common abnormalities were opacities (bilateral or unilateral, with or without pleural effusion), multiple ground-glass opacities, and infiltrate. Among those undergoing computer tomography (CT) scans, the most common abnormalities observed were ground-glass opacities (accompanied or not by septal thickening), infiltration abnormalities, and parenchymal consolidation. Only a small number of persons were observed to have normal chest radiographical or CT findings. Other investigators described that radiological examinations revealed ground-glass opacities in up to 86% of COVID-19 patients with 76% of COVID-19 patients presenting with bilateral distribution and 33% peripheral distribution.

Interestingly, COVID-19 patients were not observed to present with lung cavitations, discrete pulmonary nodules, pleural effusions, or lymphadenopathy. Finally, COVID-19 patients undergoing autopsy showed bilateral diffuse alveolar damage associated with pulmonary edema, pro-inflammatory concentrates, and indications of early-phase acute respiratory distress syndrome (ARDS).<sup>[3]</sup>

Clinical examination of severe cases of COVID-19 revealed a decreased ratio of arterial oxygen partial pressure to fractional inspired oxygen ( $\text{PaO}_2\text{:FiO}_2$  ratio) with concomitant hypoxia and tachypnea. In addition, investigators have described low carbon dioxide ( $\text{CO}_2$ ) carbon dioxide levels in COVID-19 as the median partial pressure of carbon dioxide ( $\text{PaCO}_2$ ) level was 34 mmHg.

In short, hypoxia and hypocapnia are seen in severe COVID-19 cases.

It was even postulated recently, based upon analyzing clinical data reported in published studies, that there was a striking similarity between high altitude pulmonary edema (HAPE) as manifested during the acute hypoxic ventilatory response and COVID-19. This researcher observed the following similarities: arterial oxygen partial pressure to fractional inspired oxygen ratio (decreased), hypoxia (present), tachypnea (increased), partial pressure of carbon dioxide level (decreased), ground glass opacities on chest CT (present), patchy infiltrates on chest x-ray (present), fibrinogen levels/fibrin formation (increased), alveolar comprise (present), and ARDS development in severe disease (present).

There are currently no generally recognized effective treatments for COVID-19, but are urgently needed given the breadth and scope of the disease. At present, antiviral medications and vaccines are in the early developmental stages and may take many months or even years to fully develop. As a result, it is imperative to consider novel new therapeutic interventions that do not necessarily cure the underlying disease, but, instead provide supportive care to help assist patients survive COVID-19, especially given its potential to induce respiratory conditions associated with significant mortality. Respiratory conditions in COVID-19 are of such importance that it was described one of the hallmarks of a critical course of COVID-19 is the development of ARDS.



**Figure 4: COVID-19 patient in ICU.**

ARDS leads to low blood oxygenation levels and can be directly life-threatening because of the body's organs dependence upon adequately oxygenated blood. In order to more fully understand ARDS, it is important to consider how the lungs function. As one breathes, air is taken in through the nose and mouth and passes down the windpipe into alveoli within the lungs. It is in the capillaries that run through the alveoli that oxygen passes into the blood stream and is carried to all parts of the body. In ARDS, the capillaries within the lungs leak more fluid than normal into the alveoli and prevent the lungs from delivering enough oxygen into the blood stream. The consequence is that the body's organs work poorly or not at all. summarizes the delivery of hemoglobin-based oxygen molecules to peripheral tissues in a normal patient's capillary and in a COVID-19 patient's capillary.<sup>[4]</sup>

As such, supportive management of COVID-19 with respiratory and ventilator support are standard therapeutic treatments. A recent *meta*-analysis identified that the use of supplementary oxygen therapy (38.9%), invasive ventilation (28.7%), and even extracorporeal membrane oxygenation (ECMO) (0.9%) treatments were surprisingly high among 1,876 identified patients in which any kind of pharmacological and/or supportive intervention was reported. Unfortunately, regarding the standard ventilator support of COVID-19 patients, it was observed in a cohort of patients admitted to an intensive care unit (ICU) that 56% were given non-invasive ventilation at ICU admission, of whom 76% required further orotracheal intubation and invasive mechanical ventilation. The ICU mortality rate among those who required non-invasive ventilation was 79% and among those who required invasive mechanical ventilation the mortality rate was 86%.

The current standard respiratory treatments employed among COVID-19 patients are based upon long-established treatment protocols for viral pneumonia. Since, the pathology observed in COVID-19 patients is

very unlike other viral pneumonias, it is understandable that the currently employed therapies are highly ineffective. In the following section, it is hypothesized that a series of alternative treatment strategies for treating respiratory conditions will significantly improve tissue oxygenation among COVID-19 patients.

**Hypoxia Related with CHF:** Ion flux is critical to normal cardiac function, and there is significant evidence that ROS alter ion channel flux and membrane ion pump function in a biologically important manner in heart muscle. General membrane damage secondary to ROS-mediated lipid peroxidation is one mechanism by which this can occur; however, more specific ROS-mediated effects also contribute. ROS can target L-type calcium channels on the sarcolemma and suppress the  $Ca^{2+}$  current. ROS depress the activity of the sarcoplasmic reticulum  $Ca^{2+}$  ATPase SERCA2, a membrane calcium pump that has been shown to play a crucial role in cardiac calcium handling and as a determinant of myocardial contractility. SERCA2 expression is concomitantly reduced in cardiomyocytes stimulated to hypertrophy via ROS-associated signaling pathways. ROS generation can also alter the function of cardiac sodium channels, potassium channels, and ion exchangers, such as the  $Na^+/Ca^{++}$  exchanger.

In another ROS-mediated pathway that may lead to reduced contractility, ROS can decrease the calcium sensitivity of the myofilaments. Recently it was shown that the ROS-related kinase ASK-1 associates with and phosphorylates troponin T *in-vitro* and *in-vivo* and that this event diminishes contractility and alters calcium handling in cardiomyocytes. Whether this pathway contributes to human heart failure remains unknown. It has been postulated, however, that via mechanisms such as this ROS-mediated abnormality in excitation-contraction coupling, chronic exposure to ROS contributes to the progression of failure.<sup>[5]</sup>



**Figure-5: COVID patient in ventilation.**

Ventricular geometry is a major determinant of cardiac function and is also a critical determinant of myocardial oxygen consumption. Myocardial oxygen consumption is proportional to ventricular wall tension, and by Laplace's law, ventricular wall tension is proportional to  $P \times r / 2\pi$  (where  $P$  is pressure,  $r$  is the radius of curvature of the ventricle, and  $\pi$  is ventricular wall thickness). Thus, at any given pressure and myocardial thickness, a larger ventricle will consume more oxygen per gram tissue than a smaller one. Therefore, irrespective of the etiology, a failing dilated heart requires more oxygen per gram tissue than a nonfailing smaller heart. The consequences of this remain unclear, especially in the setting of heart failure unrelated to coronary disease, but it is reasonable to postulate that this alteration in myocardial oxygen consumption leads to alterations in gene expression and possibly in ROS generation. Ventricular volume reduction by aneurysmectomy or partial left ventriculectomy can lead to improved cardiac function, although in the latter case there is no clear correlation with increased survival. The role of decreased wall stress, decreased myocardial oxygen consumption, and consequent alterations in the expression of hypoxia-responsive genes in the clinical response to these procedures is unclear but of significant interest. The Acorn device, a mesh that is wrapped around the heart to limit ventricular dilation, is under clinical investigation for the treatment of heart failure. Interestingly, it is postulated that one potential benefit of this approach will be to decrease ROS generation associated with cardiac dilation.

One additional, as-yet-unproven therapeutic approach to heart failure is the induction of angiogenesis with growth factors such as VEGF, even in the absence of coronary artery disease. This approach is based on the hypothesis that myocardial hypoxia occurs as a consequence of mismatch in the relationship between myocardial mass, myocardial oxygen demand, myocardial vascularity, and oxygen delivery and that this mismatch contributes to the

genesis of heart failure. This can theoretically occur in a variety of settings, including in nonischemic dilated cardiomyopathy as a consequence of the Laplace relationship as describe above or in pathologic cardiac hypertrophy in which myocardial vascularity might not be sufficient for the increased myocardial muscle mass. Supporting this hypothesis is our finding that cardiomyocyte-specific deletion of VEGF in the mouse heart leads to hypovascularity and dilated cardiomyopathy, although this phenotype may also reflect defects in normal development of the myocardium in the absence of VEGF (Vascular Endothelial Growth Factor).

#### **Preventions of CHF during COVID-19**

Being at increased risk doesn't mean you're destined to get the disease — or that you will develop a serious case if you do catch it. But as usual, prevention is the best medicine.

- Wash hands often using soap and water for at least 20 seconds. If you can't get to a sink, use hand sanitizer that's at least 60% alcohol
- Avoid touching your face
- Clean and disinfect surfaces you touch a lot, like doorknobs, light switches, phones and keyboards (to name a few)
- Stay home (especially if your community has advised residents to shelter in place)
- Practice social distancing. Aim to keep 6 feet between you and other people if you do have to go out in the community.
- Stock up on refills of your prescription medications

#### **Protection of Heart Patients During COVID-19**

**Use Prescribed medicine by your Doctor:** use your Prescribed medicine Only. don't use Other Antibiotics or Other Drugs without Prescription. Regularly Check-up your Health Condition. Continues your heart's medicine or contact your cardiologist.<sup>[6]</sup>

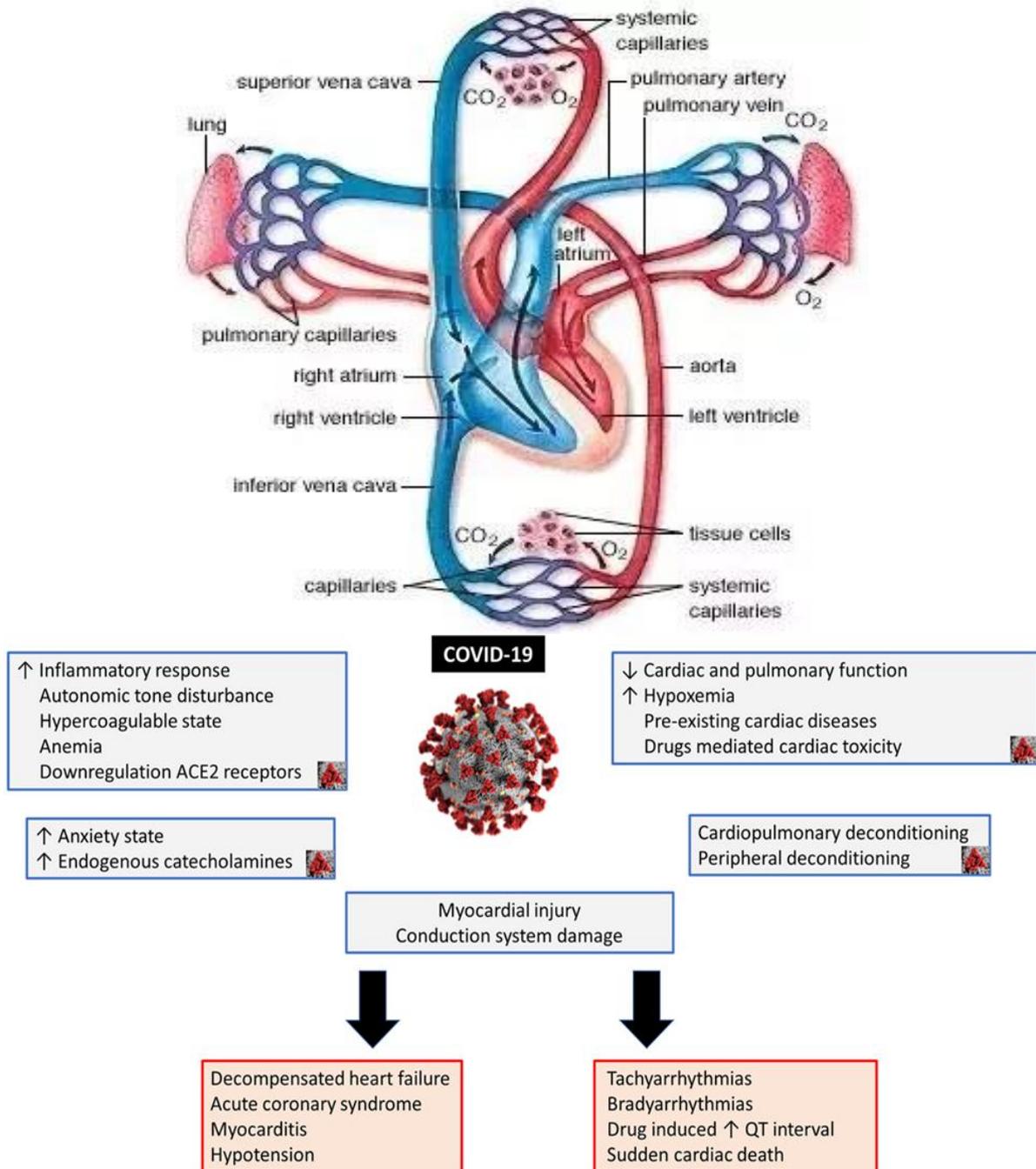


Figure-6: Vasculature of COVID-19 case.



Figure 7: Prophylactic treatment of COVID-19.

**Follow Strict advice from your Doctor:** If your hospital is still running scheduled outpatient appointments, it would be a good idea to contact them and ask if you should still attend. Many places are cancelling routine appointments or conducting them over the phone or via video online chat wherever possible. There are certain conditions where face-to-face visits are still required and you should not miss a visit without first consulting your consultant, doctor, nurse or other healthcare provider.

**Use Masks:** For the general population wearing a mask is only recommended if you are experiencing symptoms, such as a cough or a fever, or if you are caring for someone with these symptoms. Wearing a mask if you have a heart condition is not recommended as this may make breathing more difficult. If you have a heart condition and are concerned about catching COVID-19, discuss this with your doctor. To prevent shortages of face masks it is important to only use them if needed. When wearing a mask, it is important to use and dispose of them in the correct way. The World Health Organization (WHO) has useful information about this. Stay away from Seek People: maintain Social distance.

**Maintain your Diet:** You need to keep your bodily strength up, but good food also gives you vital vitamins and minerals which help combat anxiety. Whole grains, fruit and vegetables (all the colours) will work away like magic on your anxiety levels and help to reduce them. I know cakes, biscuits and chocolate are delicious, but the extra sugar hit really isn't good for anxiety. A little now and then is a good thing, but in fact eating sweets can make you feel psychologically worse. The same goes for alcohol; keep it to a minimum.

**Exercise:** Although we all have to keep a safe distance from each other now, this doesn't mean that you can't go out. In fact, going out in the daylight (even if it's cloudy) will be beneficial for your mental health. If you have a garden, walking around the garden, performing gentle (or not so gentle, depending on your ability) aerobic exercises, skipping with a rope, stepping up and down on a low step to music, all these are examples of exercise you can perform which will help alleviate anxiety. If you

haven't got a garden, think of a route you can take from your home where you will not have to be in close proximity to others and go for a walk every day.

**Use virtual methods of socializing:** If you are able to Facetime/Skype friends and family do this, even once a day, to the same or a different person each day, to take your mind off your anxiety. Or ring them. It will give you a plan - something to look forward to - and will keep you in touch with your world. Thinking of others, listening to what's happening to them and offering support works surprising well in helping to reduce your own anxiety.

**Stay busy with chores:** Make a list of things you can do. i.e. Clear out that cupboard, rearrange the room, declutter the wardrobe, weed the garden, etc. You do not have to do everything on the list, and not all at once, but it gives you further plans for you to tackle when you are feeling anxious. The feel-good factor when you have achieved something on your list is priceless.

**Recreational activity:** Listen to music, read a book, tackle crosswords, knit, sew, paint, draw, etc., etc. Any of the things which you enjoy doing but often haven't the time to do. Anything which will either provide an escape from anxious thoughts or will require concentration, will help you.

**Avoid excessive negative messaging:** Listen to the news, watching the news on TV or phone/laptop just once a day. Whilst we all need to know the latest advice regarding coronavirus and self-isolation, it is seriously anxiety-provoking to have it constantly in our ear. All you need to know will be available in one news-read. Please do not put yourself through more than this daily.<sup>[7]</sup>

**Breathing:** This simple exercise really can help when you are feeling anxious. Sit or stand in a relaxed position (tighten and loosen your muscles so that you can feel the difference between a relaxed and tense state). Concentrate on your breath and breathe in deeply to a count of 5 and breath out slowly to a count of 10. Do this several times, until you start to feel the anxiety subside enough for you to do one of the above activities.



Figure-8: Natural therapy for COVID-19 by yoga.

**Natural Precautions for Heart Patients:** Guduchi (*Tinospora cordifolia*). In Sanskrit, guduchi is also called as *Amrita*, which translates to the root of immortality. This herb, Guduchi is known for its many medicinal properties for all kind of disease, and as an immunity booster.

Amalaki (*Phyllanthus emblica* also one of the ingredients of triphala, another well-known ancient formula) is an antioxidant and, a heat stable and rich source of Vitamin C, fruit, and an immunity booster.



**Figure 9: Tulsi & Amalaki.**

Turmeric (*Curcuma longa*) takes care of allergy and immunity. Known anti-viral, antibacterial and anti-fungal spice. It has anti-inflammatory properties and gives a massive boost to your immune system.<sup>[8]</sup>

Neem (*Azadirachta indica*) can be added to turmeric as well if taking as powder. Neem is good for fever and boosts immunity.

Traditional herb mix called trikatu is part of first aid kit for all cold, and flus. It is useful as preventative for them.



**Figure-10: Immune boosters.**

A drop or two of ghee or cold pressed sesame oil inside your nostrils and sniffing it in will lubricate the nasal passage and throat, and strengthen the inner mucus membrane to keep away foreign bodies. Another tip is to reduce your sugar intake as sugar reduces your body's immunity levels.

Pranayama or breathing exercise are good for strengthening respiratory system. Prana is the life force in our body. Pranayama means the exercise of increasing the life force in our body. Anulom-Vilom and Bhramari pranayama are good and easy start.<sup>[9]</sup>

Tulsi (*Ocimum sanctum*) or sacred basil is another plant known for enhancing immunity and is traditionally used for all kind of cold, cough and flus. Tulsi herb is very effective in treating upper respiratory and lower respiratory diseases such as cough, cold, and dyspnea. Tulsi is strong anti-viral, and strengthens respiratory system. It has antibacterial and antiviral properties. You can have tulsi leaves directly or consume it in the form of herbal tea.

Trikatu promotes digestive strength, and is good for respiratory system. Trikatu is an Ayurvedic blend of equal parts of the fruits of Black Pepper (*Piper nigrum*), Long Pepper (*Piper longum*) and the rhizomes of Ginger (*Zingiber officinale*). It is used to support normal gastric function and normal circulation. An ayurvedic supplement called Chyawanprash. This ancient recipe has been used for thousands of years for immunity enhancement amongst other things.

According to the World Health Organization (WHO), the most effective way to protect yourself against corona virus is by frequently cleaning of your hands with alcohol-based hand rub or washing them with soap and water.

#### CONCLUSION

C: Clean your hands, O: Off from gatherings, R: Raise your immunity, O: Only think to wear mask, N: No to hand shake, A: Avoid large crowds.

To protect your heart, the first step is to learn your own personal risk factors for heart disease. Risk factors are conditions or habits that make you more likely to

develop a disease. Risk factors can also increase the chances that an existing disease will get worse.

Certain risk factors—like getting older or having a family history of heart disease—can't be changed. But you do have control over some important risk factors such as high blood cholesterol, high blood pressure, smoking, excess weight, diabetes and physical inactivity. Many people have more than one risk factor. To safeguard your heart, it's best to lower or eliminate as many as you can because they tend to “gang up” and worsen each other's effects.

Don't Panic for Coronavirus COVID-19 is a novel coronavirus which first came in Wuhan, China, in December 2019 and now it is pandemic in worldwide. Actually, corona viruses are zoonotic, that means they are transmitted through animals to people. SARS-CoV spread through civet cats to humans and MERS-CoV transmitted from dromedary camels to humans. But in case of COVID-19, the mechanism of action is unknown because this is a mutated gene of coronavirus. COVID-19 produced by much-a greater number of mutations into host. Vaccines and antiviral drugs are not approved till now for the treatment of COVID-19. World Health Organization (WHO) authorized 15 laboratories to provide reference testing support for COVID-19.

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