

## How Effective is India's Battle against Covid-19 Pandemic?

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### ABSTRACT

In December 2019, China witnesses its first case of Corona virus. On 11<sup>th</sup> February 2020, Corona-virus was declared named as COVID-19, by the World Health Organization (WHO). COVID-19 is a respiratory disease which affects an individual's health as a whole. The novel Corona-virus started spreading at an uncontrollable pace across the world and was therefore declared as a Pandemic disease in March 2020 by the WHO. Fever, cough, breathing difficulty and sore throat are the symptoms of this virus. The biggest problem being faced by the countries around the world in controlling the number of active cases of Covid-19 has been due to its highly contagious nature. India reported its first case on 30<sup>th</sup> January, 2020. Till date India has reported around 27 lac cases of Covid-19. This number is only about 2% of the India's total population. It can be safely concluded that India has done reasonably well in dealing with the Covid-19 pandemic inspite of its high population density of 464 persons per sq. km. In this manuscript, an attempt has been made to visualize the India's success story to combat this pandemic situation.

**Keywords:** COVID-19, Immune, Cause, Prevention, Society, Health

### 1. INTRODUCTION

An adverse contagious disease, Coronavirus disease 2019 (COVID-19), was identified in the capital of Hubei province of China, Wuhan, in December 2019 [1]. It is mainly caused due to severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) [2-3]. As a result of this globally spread disease, 2019-2020 coronavirus pandemic is the outcome. On 1 December 2019, the onset of symptoms was confirmed through the study of first 41 cases of confirmed COVID-19 and this was published in January 2020 in the Lancet [4]. Official publications from the WHO reported the earliest onset of symptoms as 8 December 2019.

Approximately, 1 lakh people got infected with COVID-19 within 67 days (~7th March). Further 1 lakh positive cases were reported within the next 12 days (~19th March) and within another 4 days (~23rd March), SARS-CoV- 2 was declared to be a highly transmissive type virus. Across the globe, an exponential trend was seen in the number of cases reaching to a total of 7.25 lakhs by 30th March, 2020, and to a total of 25,118,689 by 18th August 2020. Among the deadly diseases under PHEIC (public health emergency of international concern), COVID-19 became the sixth ranked outbreak. The list of the first five outbreaks include H1N1 (2009), polio (2014), Ebola(2014 in West Africa), Zika (2016), and Ebola (2019 in the Democratic Republic of Congo) [5].

The country with a record of having the second-largest population in the world, India, has a developing economy. It has also been one of the worst affected countries by COVID-19.

Approximately 27 lakh people were infected by 18th August, 2020. This number is only about 2% of the India's total population. It can be safely concluded that India has done reasonably well

in dealing with the Covid-19 pandemic inspite of its high population density of 464 persons per sq. km. The overall casualty rate in India is also far below the world average. The deaths were not only due to the virus but also due to unemployment and hunger. People experienced economic crisis and mental breakdown which eventually led to their death. India saw the only solution to deal with the virus was to forcefully execute a 68 days of lockdown which unfolded in four-phases. The duration of the enforced lockdown was from 24th March ~31st May, 2020.

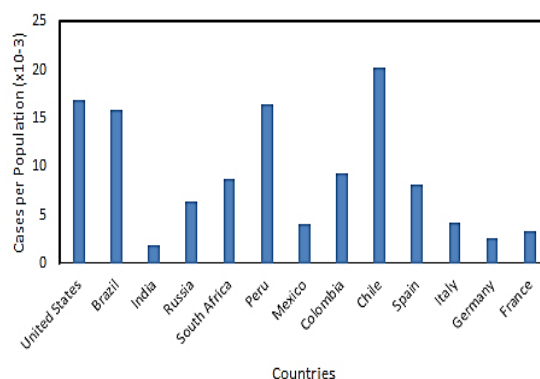
## **2. INDIAN SITUATION FOR COVID-19**

The beginning in the COVID-19 cases in India was not a result of transmission of the virus within the country. But, it started as people returned from abroad. The country recorded its first three cases in Kerala on 30th January and 3rd February, 2020 as they returned from Wuhan China [7]. It did not take more than a month for two more cases to be reported in the country. The confirmation of them being infected by the virus came on 3rd March. One of the patients belonged from Hyderabad and had visited Dubai, while the other person had travelled back from Italy. Simultaneously, Jaipur [8] reported a few cases on the same day. Immediately, the Ministry of Health and Family Welfare (MoHFW) came into action and imposed restrictions on travel. Similar travel advisory restrictions were imposed during SARS, Ebola, and bubonic plague pandemics. These also included the rules for 14 days of self-quarantine for all those who travelled back to the country from an international trip. On 16th March, various other laws including social distancing of less than 1m was proposed by MoHFW. Until 15th April, the visas were also restricted for foreign countries [9]. All these measures were taken in order to decrease the community spread of the disease and its mortality rate [10].

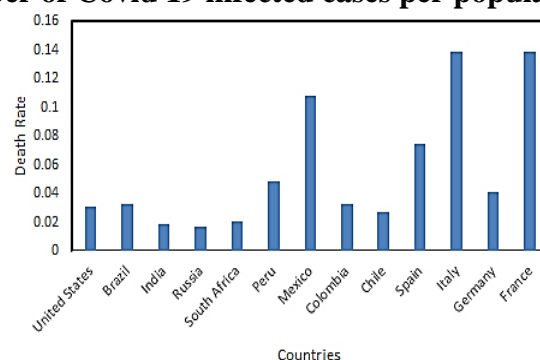
The series of measures taken to contain the virus unfolded as, on 22nd March the Prime Minister, Narendra Modi enforced a 14 hours Janata curfew in the country [11]. The first phase of 21 days lockdown from 24th March drastically reduced the movement of the inhabitants to the public places [12].

On 14th April [13], 2nd phase of lockdown started due to the continuous increase in the number of cases. This phase ended on 3rd May, after which the 3rd phase got declared till 17th May. As this phase of lockdown started nearing its end, it was declared extended till 31st May [14] as the fourth phase. The quarantine law was soon levied under the Epidemic Disease Act, 1897 in order to make the social distancing and lockdowns norms more concrete and effective. This legislation is 123 years old. Through this, the state or the country gets the authority to examine the people travelling by various commodities such as ships, airways and railways. The suspected people can also be segregated in hospitals and other temporary accommodations [15]. India reported its first COVID-19 positive case on 30th January. By 15th March, the total confirmed count of infected persons reached 107 and thereafter the cases have been going on increasing at an exponential rate. It was observed that there was a multiplication by 10 times in the confirmed cases in the country within a time span of 15 days, i.e. from 15th March to 30th March. 29 deaths were reported in country with the number of cases crossing 1071 by 30th March. According to Indian Council of Medical Research (ICMR), India could have seen a significant drop in the number of cases by 62% if the social distancing and quarantine norms were brought into force effectively. A study even revealed that by mid-May, India would have supported approximately 13 lakh cases in case the virus spread is not controlled. However, the spread of the virus could be reduced by increasing the restrictions, testing and various other firm measures [17]. By 18th Aug, the confirmed cases touched the soaring levels of approximately 27 lakh in the country.

The country had actually managed very well in dealing with this pandemic in the beginning, however, as the lockdown phases started coming to an end, the cases sky-rocketed to 27,68,670 with 53,026 deaths in total till 19th August 2020.

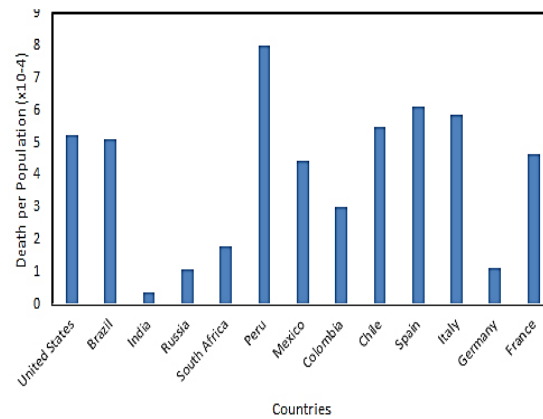


**Fig. 1. Number of Covid 19 infected cases per population strength**

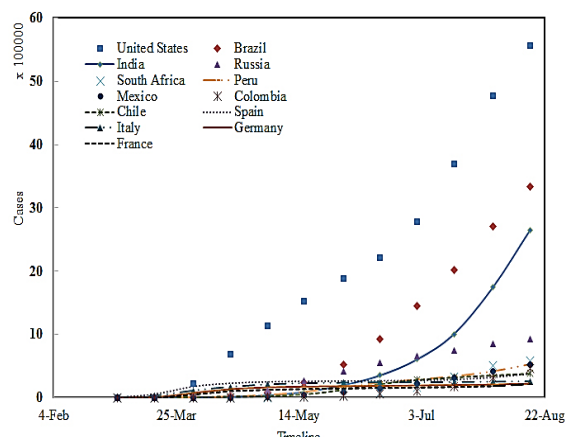


**Fig. 2. Death Rate**

Though the total population of around 27 lacs is infected by Covid 19 but this figure is far less when the Indian scenario is being compared with other developed countries. Figure 1 shows the number of Covid 19 infected cases for the various countries per population strength of these respective countries. The figure clearly predicts that India is in much more comfortable position as compared to the most of the countries in the world. Figure 2 shows the death rate due to Covid 19 for the various countries. This bar graph also suggests that the casualty rate in India is far less as compared to the most of the countries of the world which is also suggested by Figure 3 indicating the number of Covid 19 casualties for the various countries per their respective population strength. Figure 4 shows the trends in the rise of Covid 19 cases in the various countries from 4<sup>th</sup> February, 2020 to 22<sup>nd</sup> August, 2020. This trend is also in favour of India. Moreover, from Table 1, it is clear that India's population density is far more than most of these countries. Even then, the spread of this highly contagious virus is not up to that detrimental level. So, there must be certain factors that are safeguarding India from the adverse effects of Covid 19. In this manuscript, an attempt has been made to recognize this factor which is helping India in its fight against this pandemic. These may be due to the proactive actions by the Government of India, BCG vaccine, malarial state, India's strong belief in Ayurveda, Yoga, Naturopathy, and the Indian food habits, etc.



**Fig. 3. Number of Covid 19 casualties per population strength**



**Fig. 4. Trends in number of Covid 19 infected cases**

**Table 1: Population Density and Death Rate of Different Covid 19 affected Countries**

Country	Total cases	Total population	Population density (persons per sq. Km)	Death rate
United States	5,612,027	331,256,357	36	0.0309
Brazil	3,363,235	212,756,034	25.06	0.0323
India	2,706,450	1,381,752,440	464	0.0191
Russia	932,493	145,942,798	9	0.0170
South Africa	589,886	67,614,508	49	0.0203
Peru	541,493	33,030,127	26	0.0489
Mexico	525,733	129,106,847	64.91	0.1084
Colombia	476,660	50,952,553	46	0.0322
Chile	387,502	19,137,440	26	0.0271
Spain	382,142	46,757,191	94	0.0749
Italy	254,235	60,449,906	206	0.1392
Germany	226,686	83,819,291	240	0.0410
France	219,029	65,292,634	119	0.1389

### **3. SIGNS AND SYMPTOMS**

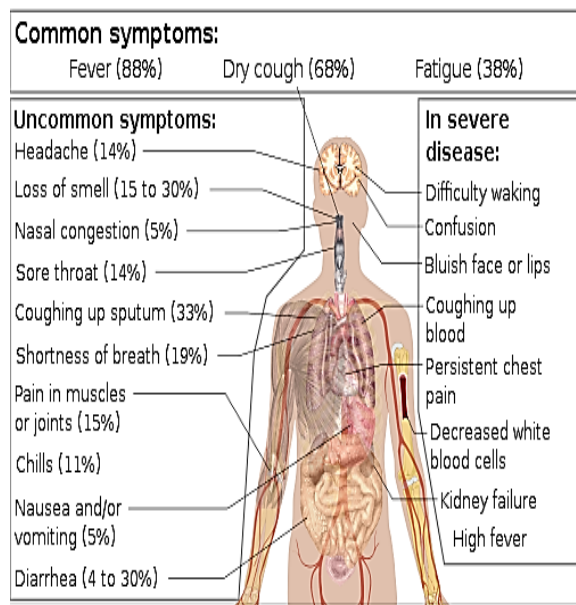
The people who get infected with the virus may initially develop flu-like symptoms or may be asymptomatic [18]. These asymptomatic cases may also contribute to spreading of the disease [19]. The flu-like symptoms include fatigue, cough, shortness of breath, and fever, as shown in Figure 5. Medical attention needs to be given immediately to those with symptoms such as persistent chest pain or pressure, bluish face or lips, confusion, and difficulty in breathing and walking. Symptoms such as vomiting, nausea, and diarrhea have been observed in people [20]. In March 2020, in case of those who have mild disease, loss of sense of smell (anosmia) has also been declared as a common symptom, although it was not common in the initially reported cases [21]. Initially in China, people were seen with chest tightness and palpitations only.

The incubation period, the time between the moment when a person is infected with the virus and when symptoms are developed, ranges from two to fourteen days but is five to six days typically. 97.5% of people who develop symptoms will do so within 11.5 days of infection [22]. As of 10 April 2020, the percentage of people who did not display symptoms was unknown and was being extensively studied. The Korea Centers for Disease Control and Prevention (KCDC) also confirmed that the 20% of the cases confirmed did not display symptoms in whole of their stay in the hospital [23]. China's National Health Commission started including asymptomatic cases in its daily cases on 1 April and the 166 infections on 1 April, 130 (78%) were asymptomatic [24].

### **4. PREVENTION**

Various preventive measures have been recommended to people to reduce their chance of getting infected and spread the virus. These measures suggest staying at home, washing hands frequently with soap and water and for at least 20 seconds, avoiding crowded places, avoiding touching eyes, nose or mouth with unwashed hands and practicing good respiratory hygiene [25]. For now, since a vaccine is not expected until 2021, COVID-19 management includes “flattening the curve”, i.e. decreasing the epidemic peak by providing good treatment to the current cases and holding back the future cases until a vaccine and effective treatment is available [26-27].

Although, according to WHO, the person who is coughing and sneezing the person who is treating an infected person are recommended to wear face masks. But some countries like China, Hong Kong, Austria, Thailand, and Czech Republic recommend even healthy people to use face masks. Since the demand for medical face masks are increasing, the WHO has estimated an increase in the mask production by 40% to meet the growing needs. The price of the masks have increased six fold, N95 respirators tripled, and gowns doubled. Hoarding and speculation are the reasons behind the above mentioned hike in prices.



**Fig. 5. COVID-19 Symptoms [6]**

## 5. IMMUNITY

The immune system of India is better than the other countries because India is the ‘Land of Yoga’ and origin of ‘Ayurveda’ [28-31]. There are three inherent factors in Indian origin that basically helps in improving the immune system these are:

First, the population’s wide based immunity due to the substantial microbial load and general exposure to a range of pathogens, though pathways still need to be investigated, may prime Indians immunologically for strong adaptive and cross-reactive T- cell memory. In fact, India has been plagued by the three major killers of HIV, TB and Malaria. Therefore, since the late 1940s, widespread use of BCG vaccine in India may have provided an opportunity for the development of effective and adaptive immunity against infection and it may include the suspected COVID-19 virus among others [32].

The second factor is similarly significant aspect which is linked to the climate and food behaviors which can provide some degree of resistance to disease. In Ayurveda and other Indian medicine systems there is much literature about the definitive beneficial effects of Indian spices in increasing immunity [33].

The third important aspect is the substantial HL variation of the Indian population with the presence of many ‘unique haplotypes’ and ‘novel alleles’.

The following points are sufficient to uplift our immunity while staying indoors.

### A. Vitamin C

Vitamin C brims with immunity boosting properties and superior defense mechanism. It has been regarded as an essential nutrient by National Pharma Pricing Authority. A regular intake of just 1000mg Vitamin C or Ascorbic Acid can act as a supplement for boosting one’s immunity.

- **Lemon Zest:** Each 100gm peel can give us about 129 mg of Vitamin C or ascorbic acid. It can help in protecting various tissues from cancer. This is possible as it contains Salvestrol, Q40, and Limonene which are known to help fight cancer cells. It can consumed as an alternative to amchoor or with lemon tea.

#### **B. Kadha, Ayurvedic Concoction Immunity Booster**

An Ayurvedic drink, kadha, contains various herbs and spices. The medicinal properties of these spices are extracted by boiling them in water for 15-20 minutes. Herbs and spices that can be used include turmeric root, ginger root, Cinnamon powder, Tulsi leaves, cloves, Mint leaves, and a dash of freshly ground Black Pepper. This kadha can be reheated to be consumed at some other time. It not only helps in boosting the immunity, but also improves digestion, detox liver and whole body.

#### **C. Take Immunity-boosting Vitamins**

To be able to defeat the infections and viruses and to boost immunity, foods like garlic, spinach, broccoli, citrus fruits, and so on and Vitamins and Minerals such as Vitamin C, Vitamin D, Vitamin B, and Zinc must be consumed.

#### **D. Yoga asanas**

In times of stress and anxiety, the deep tissue that surrounds our muscles, bones, organs, tendons, and ligaments (called fascia) becomes vulnerable to damage. We need to move, relax and stretch our body to de-stress the fascia. The harmful toxins, which get accumulated in our nerves during stress can be removed by stretching our body as this provides direct oxygen to blood and cells. As a result of which, blood circulation in our body increases and the toxins get removed.

#### **Sphinx Pose (Salamba Bhujangasana)**

A highly therapeutic pose for the nervous system, it is an awesome pose to fight depression and anxiety. It energizes the mind and body and also provides a soothing sensation. It is also known to alleviate stomach pain and massages lower abdomen.

#### **Revolved Chair Pose (Parivrtta Utkatasana)**

This pose is wonderful in providing relaxation to the kidneys and digestive organs, simultaneously detoxifying them internally. This pose is ultra-grounded and helps deepen the breath.

#### **Standing Backbend (Anuvittasana)**

Backbends are specifically detoxify the adrenal glands and relaxes the exasperated mind caused due to stress. It strengthens the lungs and respiratory system and opens up the nasal passage.

#### **Eagle Pose (Garudasana)**

This balancing pose helps to stimulate fresh blood circulation throughout the body. This is done by squeezing pressure points of arms and legs—giving the body a jolt of immunity-boosting fluid. The increase in breath further stimulates blood flow throughout the mind and body. This helps in releasing tension and stagnant energy in the body.

#### **Happy Baby (Ananda Balasana)**

The deep hip-opening sensation while lying on the back is a very therapeutic and non-confrontational way to give the body relaxed nourishment. As we hold emotional tension in our hips, so this pose is wonderful to release the toxins and provide a relaxing sensation to our mind. It also stimulates the kidneys and digestion.

Happy Baby is truly one of my favorite asanas. The deep hip-opening sensation while laying on the back is a very therapeutic and non-confrontational way to give the body relaxed nourishment. Again, because it holds emotional tension in our hips, Happy Baby is a fantastic pose to relax the mind and ring out toxins. It also stimulates the kidneys and digestion. The rocking motion from side-to-side can further provide exceptional benefits.

#### E. Neem Chutney

Neem, bitter in taste but a 'reservoir of goodness'. It helps in boosting the immunity by reducing inflammation in the body, cardiovascular health, improving liver health and eyesight. It has also been proved beneficial in treating skin diseases, dental disorders, and ulcers. Neem chutney can be prepared by mixture of jaggery (rich source of iron, selenium, and zinc), honey (anti-bacterial) and saunth.

#### F. Coconut Oil

Coconut oil consist of Lauric acid which is known to have "antiviral properties". A concoction or Kadha of herbs like Cinnamon, Ginger, Sage, Rosemary and a tablespoon of coconut oil can be made.

#### G. Intermittent fasting

To stop infections from multiplying, intermittent fasting or a fasting for minimum of 12-16 hours can prove to be beneficial. Fasting enhances autophagy. This means that damaged proteins can be metabolized by our immune system in our body. Fasting gives some resting time to our organs thereby, enhancing their functional capacity.

#### H. Hot Beverages

Staying hydrated helps eliminated constipation and thus prevents toxins from piling up in our body. For this, hot beverages such as coffee, tea, Dal soup, Tomato soup, green tea, hot water must be consumed continuously. This will also prevent us from sinus and improve digestion.

#### I. Exercise, But Not Too Much

Mild exercises prove to be beneficial for boosting immunity but heavy workout during lockdown period can make the body feel exhausted. Simultaneously, proper rest should also be given to the body.

#### J. Minimize Exposure to Toxins

Many toxins including mycotoxins can be devastating for the immune system. So one must stay away from food additives, pesticides, chlorinated water, air pollution, food additives, aromatic hydrocarbons and so on.

#### K. Don't Smoke

Smoking causes many severe and long lasting illnesses. It increases susceptibility of a person to fall prey to diseases such as influenza, pneumonia and so on. Smokers have weak respiratory system. It also lowers the content of protective antioxidants like Vitamin C in the blood. One of the primary symptoms of COVID-19 includes shortness of breath. Since smokers already have weaker lungs so they are one of the easily susceptible persons to COVID-19.



#### L. Take A Cold Shower

Cryotherapy, a method by which the body is exposed to intense cold for short period of time. This causes the blood vessels near the skin to contract (vaco-constriction) and redirect blood to major organs to maintain core body temperature. While this happens, the blood in our body gets filled with nutrients, oxygen, and restorative enzymes. This blood then makes its way back to our skin, muscle tissue and organs. Wim Hof, the master of all cold things, elucidates about the benefits such as reduced inflammation, improved quality of sleep, faster metabolism, improved immune response, and enhanced focus and concentration.

#### M. Laughter!

Laughter is the best medicine!

It has the power to increase immune cells and antibodies, release tension and endorphins (endorphins trigger positive feeling in the body) and decrease stress hormones. According to researches, it has been found that approximately 40 calories can be burnt with a good laugh for at least 10-15 minutes a day.

#### N. Immunity Promoting Foods

Those food items which tend to make our inner self stronger include:

**Garlic:** A great immune-boosting ingredient. It contains sulfur-containing compounds in concentrated quantity. Blood pressure can be lowered and hardening of arteries can be slowed down by consuming garlic.

**Turmeric:** Commonly known for its anti-inflammatory properties. It can strengthen the immune system along with providing benefits to the brain. The neurological conditions such as Alzheimer's disease, migraine headaches, and depression, three known contributors to mental fatigue, can be improved by having turmeric.

**Spinach:** Rich in vitamin C, antioxidants and beta carotene it supports the infection-fighting activities of our immune systems. Retain its nutrients by eating raw (in a salad) or cooking as little as possible.

**Citrus fruits:** A good source of Vitamin C. Vitamin C helps increase white blood cells which are the key to fighting infections.

**Broccoli:** It contains vitamins A, C and E, fiber and antioxidants. Try cooking to cook as little as possible to really get the best out of it nutritionally.

## 6. CONCLUSION

The Pandemic disease of Corona-virus is creating a serious impact on the life of individuals with everyone in the world facing its dire consequences, either directly or indirectly. Unprecedented lockdowns and emergency have been declared in many countries. The Governments have shut down the Schools, Market Places, Theatres, Shopping Complexes, Colleges, and Universities. An environment of fear, anxiety and stress prevails among the developed and developing nations. Advisories related to the impact of the Novel Corona-virus have been issued by the WHO and all the member nations. However, panic states due to uncertainty, economic recessions, social anxiety, and extreme mental stress are the results of lockdowns and extreme isolation. It is found that countries like India with universal policies of BCG vaccination have been more successful affected compared to other countries where this vaccine is optional. For India, it can be safely concluded that the spread, penetration and the casualty rate due to the novel Covid 19 virus is far more controlled than most of the well developed nations of the world.

The important factors that are supporting India's fight

against Covid 19 are the better immune system, food habits, belief in Ayurveda, Yoga, Naturopathy, and proactive Government of India.

## 7. CONFLICT OF INTEREST

The authors of the presented manuscript have contributed significantly in the research work and hereby declare no conflict of interest. The authors mutually agree on the order of name of authors for the presented manuscript.

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