MINI-REVIEW ARTICLE

To Study the Spread Curve of Corona Virus in India

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Abstract: Background: Surprisingly, all the developed countries across the world are reeling under death due to the Coronavirus infection cases (COVID 19), but a developing country like India with the second largest population still here, the casualty is very less and recovery rate is very high due to the strong immunity of the people, vaccination regime for other diseases and hot and humid condition of the country.

Objective: Yet, the greatest number of cases are in the State of Maharashtra, Tamil Nadu, Delhi, Karnataka, Gujrat, Uttar Pradesh, and Telangana the Western, Central, and Southern part of the country surprisingly the Eastern part of the country have a less number of active cases and also the mortality except for West Bengal.

Conclusion: In the State of Jharkhand very less number of active cases i.e., 2785 and mortality is only 49, is there any role of geographical condition or there is some strong genetic form so that the inhabitants have very strong immune resistance to develop the infection initiated by the virus. In this review, these questions are in focus and may be solved.

Keywords: ACE2, India, COVID19, Jharkhand, heat, polymorphic.

1. INTRODUCTION

The current epidemic of the Coronavirus in Wuhan, China, is now the biggest threat to the survival of humankind in the Earth. The worse hit countries in the number of cases and the fatality due to the infection are the USA, Brazil, Italy, Spain, and Iran. What is the reason is a million-dollar question to solve? Everyday the death due to the virus is 500-600, which is remarkably high. Some information suggests that the fatality in Italy due to the wrong diagnosis and a greater number of elderly persons. Nevertheless, if it is true, why is there a greater number of fatalities throughout the world. Why the number of active infections is increasing day by day in the USA with a highly equipped medical system in place. This may be due to the genomic make-up of the persons of the different regions of the world. In India, the rate of fatality is not that high (Table 1) if it is compared with the world statistics. The lifestyle is one of the most imperative cause of the incidence. In India, the citizens are still following the traditional values of Veda and Purana, the religious books of the country. Following the traditional values like eating with hand, taking very well-cooked food, very low consumption of the non-vegetarian food, and thanks to the not very stringent sanitization, due to which the immunity development to any disease is extremely high.

2. STATISTICS

The number of active cases is sporadic, but the pattern is the modern and richer the state with modern amenities, the number is more and the poorer the state, the number is very less and in Jharkhand, there are 5552 (Table 1) cases although it has 32 tribal communities with no modern medical system. Every minute the same pattern is evident in these states.

However, some experts see it contrarily. India is mostly safe, and this comparative protection lies in its weather, which acts as a protection against the virus, says K. K. Aggarwal, President, Heart Care Foundation of India. That could be precisely the reason why Ebola, yellow fever, SARS, and MERS, which took many lives worldwide in the last decade had a minor effect on India.

Most of the reports suggest that the countries that are having climatic temperature less than 18 °C there infection of the said virus are extremely high. However, compared to these countries the climatic condition of India is comparatively hot and humid.

In the temperate region of the world “seasonal flu” and “common cold” caused by coronaviruses likely to spread more freely in winter. That may be due to the drier air indoors and outdoors in the colder months, and dry conditions always support flu transmission. The immune system of humans is feeble in winter, probably due to not as much sunlight and poorer levels of vitamin D.

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### Table 1. The number of active cases in Indian states.

<table>
<thead>
<tr>
<th>20 Jul, 12:38 AM IST</th>
<th>Confirmed +40,243 11,18,107</th>
<th>Active 3,89,803</th>
<th>Recovered +22,742 7,00,399</th>
<th>Deceased +675 27,503</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>State/UT</strong></td>
<td><strong>CONFIRMED</strong></td>
<td><strong>ACTIVE</strong></td>
<td><strong>RECOVERED</strong></td>
<td><strong>DECEASED</strong></td>
</tr>
<tr>
<td>Maharashtra</td>
<td>↑9,518 3,10,455</td>
<td>1,28,730</td>
<td>↑3,906 1,69,569</td>
<td>↑258 11,854</td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>↑4,979 1,70,693</td>
<td>50,297</td>
<td>↑4,059 1,17,915</td>
<td>↑78 2,481</td>
</tr>
<tr>
<td>Delhi</td>
<td>↑1,211 1,22,793</td>
<td>16,031</td>
<td>↑1,860 1,03,134</td>
<td>↑131 3,628</td>
</tr>
<tr>
<td>Karnataka</td>
<td>↑4,120 63,772</td>
<td>39,366</td>
<td>↑1,290 23,066</td>
<td>↑191 1,336</td>
</tr>
<tr>
<td>Andhra Pradesh</td>
<td>↑5,041 49,650</td>
<td>26,118</td>
<td>↑1,127 22,890</td>
<td>↑156 642</td>
</tr>
<tr>
<td>Uttar Pradesh</td>
<td>↑2,211 49,247</td>
<td>18,256</td>
<td>↑1,181 29,845</td>
<td>↑138 1,146</td>
</tr>
<tr>
<td>Gujarat</td>
<td>↑965 48,441</td>
<td>11,413</td>
<td>↑877 34,882</td>
<td>↑120 2,146</td>
</tr>
<tr>
<td>Telangana</td>
<td>↑1,296 45,076</td>
<td>12,223</td>
<td>↑1,831 32,438</td>
<td>↑6 415</td>
</tr>
<tr>
<td>West Bengal</td>
<td>↑2,278 42,487</td>
<td>16,492</td>
<td>↑1,344 24,883</td>
<td>↑36 1,112</td>
</tr>
<tr>
<td>Rajasthan</td>
<td>↑934 29,434</td>
<td>7,145</td>
<td>↑586 21,730</td>
<td>↑6 559</td>
</tr>
<tr>
<td>Bihar</td>
<td>↑1,412 26,379</td>
<td>9,603</td>
<td>↑826 16,597</td>
<td>↑12 179</td>
</tr>
<tr>
<td>Haryana</td>
<td>↑617 26,164</td>
<td>6,022</td>
<td>↑475 19,793</td>
<td>↑5 349</td>
</tr>
<tr>
<td>Assam</td>
<td>↑1,018 24,000</td>
<td>7,911</td>
<td>↑858 16,024</td>
<td>↑4 62</td>
</tr>
<tr>
<td>Madhya Pradesh</td>
<td>↑837 22,600</td>
<td>6,568</td>
<td>↑447 15,311</td>
<td>↑15 721</td>
</tr>
<tr>
<td>Odisha</td>
<td>↑736 17,437</td>
<td>4,865</td>
<td>↑516 12,453</td>
<td>↑7 119</td>
</tr>
<tr>
<td>Jammu and Kashmir</td>
<td>↑701 13,899</td>
<td>5,844</td>
<td>↑646 7,811</td>
<td>↑8 244</td>
</tr>
<tr>
<td>Kerala</td>
<td>↑821 12,481</td>
<td>7,064</td>
<td>↑172 5,370</td>
<td>↑2 43</td>
</tr>
<tr>
<td>Punjab</td>
<td>↑308 10,100</td>
<td>3,311</td>
<td>↑81 6,535</td>
<td>↑8 254</td>
</tr>
<tr>
<td>Jharkhand</td>
<td>↑167 5,552</td>
<td>2,785</td>
<td>↑62 2,718</td>
<td>↑1 49</td>
</tr>
<tr>
<td>Chhattisgarh</td>
<td>↑161 5,407</td>
<td>1,608</td>
<td>↑117 3,775</td>
<td>↑24 24</td>
</tr>
<tr>
<td>Uttarakhand</td>
<td>↑239 4,515</td>
<td>1,311</td>
<td>↑35 3,116</td>
<td>↑2 52</td>
</tr>
</tbody>
</table>

(Table 1) contd....
Individuals are also inclined to devote more time at home in winter, often in crowded conditions. Schools in specific are sources of infectious disease spread; for example, the 2009 outbreak of swine flu in the US plunged suggestively throughout the summer holidays of school and increased rapidly when people resumed to school in September.

According to Elizabeth A. Repasky, Ph.D., a researcher, Department of Immunology at the Roswell Park Cancer Institute in Buffalo, New York “since prehistoric times it has been known escalation in body high temperature is linked with infection and inflammation”.

Researchers found that by mild fever, enhanced generation and differentiation of "CD8+ cytotoxic T-cell" (capable of destroying virus-infected cells and tumor cells) is facilitated. Specifically, there is alteration in the membranes of T-cell by the high body temperature, which may help to facilitate the effects of micro-environmental temperature on cell function. To scrutinize this, two sets of mice were injected with the same antigen, and the activation of T-cells were examined subsequently interaction with antigen-presenting cells. Body temperature in half of the mice was increased by 2 °C, while the other half maintained a normal core body temperature. In the warmed mice, it has been observed greater quantity of the CD8 T-cells capable of destroying infected cells were produced [1].

There are two obvious questions:

3. IS IT POSSIBLE THAT HOT WEATHER CONDITIONS CAN PREVENT COVID-19 TRANSMISSION?

3.1. Can Viruses be Killed in Sunlight?

It most likely can slow down the growth, viability, or stability of the virus but to what extent it is not being known.
If somebody is infected with the virus, and because of the sneezing of that person, the next person will be infected. In such situations, there is no effectiveness of heat is observed. It has been known that the virus can survive in the human body at 37 °C. Therefore, heat is no controlling factor for its spread. The only possibility is that it may not survive in the open-air. Therefore, the inhibition will not be possible by the hot Indian summer it will transmit as effectively. However, the virus may not survive outside for long. That is the only advantage, Dr. V. Ramasubramanian, Consultant, Infectious Diseases, Apollo Hospitals.

The chance of most vector-borne disease spread will decrease in places that are currently relatively warmer. This warming will increase the chance of spread in places that are currently relatively colder. Rob Jordan, Stanford Woods Institute for the Environment.

To infect human host viruses must be able to enter the cells of the individual. They use these machinery of the cells to produce copies of themselves, which then spill out and spread to new cells. There is a very important protein called ACE2 angiotensin I converting enzyme 2 related to this phenomenon.

On Feb. 19 in the journal Science, a group of researchers headed by scientists at the University of Texas at Austin defined the small molecular key on SARS-CoV-2 that gives the virus entry into the cell. These small molecules are called a spike protein, or S-protein. Zhou and his team described ACE2 receptor protein, which is present on the surfaces of respiratory cells, and the interaction of it and spike protein. The findings are published in the journal Science on March 4.

Some of the reports suggest that the ACE2 angiotensin I converting enzyme 2 in Indian populations especially in the eastern part of the country is polymorphic. This is maybe the reason why the virus is not gaining entry in the respiratory cells of the populations of this region. ACE2, a transmembrane protein serves as the main receptor point through which coronaviruses gain entry to cells, including HCoV-NL63 [2], SARS-CoV (the virus that causes SARS) [3-5], and SARS-CoV-2 [6] the virus that causes COVID-19 [7-9].

This has directed the researcher to assume that reducing the levels of ACE2, in cells, might help in fighting the infection. ACE2 has also been shown to have a defensive effect against virus-induced lung damage by increasing the production of vasodilator angiotensin 1–7. Furthermore, according to studies on mice, the interaction of the spike protein of the coronavirus with ACE2 induces a drop in the levels of ACE2 in cells through internalization and degradation of the protein and hence may contribute to lung damage [10, 11].

Both ACE inhibitors and angiotensin receptor blockers (ARBs) that are used to treat high blood pressure have been shown in rodent studies to upregulate ACE2 expression hence may affect the severity of coronavirus infections [12, 13]. However, multiple professional societies and regulatory bodies have recommended continuing standard ACE inhibitor and ARB therapy [14-16]. "Use of ACE inhibitors was associated with a significant 34% reduction in risk of pneumonia compared with controls." Moreover, "the risk of pneumonia was also reduced in patients treated with ACE inhibitors who were at higher risk of pneumonia, those with stroke and heart failure. The use of ACE inhibitors was also associated with a reduction in pneumonia-related mortality, although the results were less robust than for overall risk of pneumonia" [17].

In developing countries, most individuals with diabetes are aged between 45 and 65 years while in developed countries, the majority are older than 64 years.

The patients with type 1 or type 2 diabetes, who are treated with ACE inhibitors and angiotensin II type I receptor blockers (ARBs) there is substantially increased expression of ACE2 [18].

ACE inhibitors and ARBs are also used in the treatment of hypertension, which results in an upregulation of ACE2 [19].

Thiazolidinediones and ibuprofen can also increase the expression of ACE2. These data suggest that ACE2 expression is more in diabetes and treatment with ACE inhibitors and ARBs increase ACE2 expression. Consequently, the increased expression of ACE2 would expedite infection with COVID-19. Therefore, it is assuming that diabetes and hypertension treatment with ACE2-stimulating drugs increases the risk of developing severe and fatal COVID-19.

There is an advisory issued by the World Health Organisation (WHO), the patients with COVID-19-like symptoms to avoid the anti-inflammatory drug ibuprofen unless prescribed by doctors.

This followed an article published in The Lancet Respiratory Medicine suggesting that certain drugs, including ibuprofen, may make patients more susceptible to COVID-19, as well as a warning by France’s Health Minister that such patients should avoid painkillers like ibuprofen and aspirin.

The use of NSAIDs is comparatively less in India compared to developed countries and it is also very less in the eastern part of India because this region is having more tribal populations and they are not taking modern medicinal system for the treatment of any ailments they mostly depend on the medicinal plants and their products for the treatment purposes.

CONCLUSION

COVID-19 is a pandemic throughout the world. Still compared to the other developed countries the number of active cases is going to increase day by day, but the mortality rate is very less. There may be other reasons but, in this study, some particularly important reasons are discussed. The strong immune system and lifestyle may contribute to the less mortality in India and especially in the eastern part of India. A very stringent vaccination regime for other diseases is also contributing to this scenario. Thanks to the Government of India for an extreme step of lockdown for 68 days is also the reason for the same. Now the active cases are rising every day that is due to the carelessness and it will not happen to me attitude. Nevertheless, there is a long way to go before drawing any conclusion. However, we should pray to the supreme unseen power to give us the strength to over-
come this grim calamity very soon so that there will be less casualty as possible.

CONSENT FOR PUBLICATION
Not applicable.

AVAILABILITY OF DATA AND MATERIALS
The data supporting the findings of the article is available in the COVID19INDIA at https://www.covid19india.org

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CONFLICT OF INTEREST
The authors declare no conflict of interest, financial or otherwise.

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