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Review Article

PROTECTIVE EFFECT OF *CURCUMA LONGA* (TURMERIC) AND ITS ACTIVE INGREDIENT CURCUMIN AGAINST COVID-19: A MINI REVIEW

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ABSTRACT

Prevention is better than cure. As till date, no vaccine or particular medicinal facility is developed for COVID -19 treatments, taking protection is the best policy. Wearing face mask, using hand sanitizer, maintaining social distancing and boosting immunity power are the only ways to fight against SARS-CoV-2(COVID-19). In this review how Turmeric can boost adaptive immune system of humans and it can be used as a protective agent against COVID-19 has been discussed.

Keywords: COVID-19, SARS-CoV-2, Turmeric, Curcumin, Immunity,

1. INTRODUCTION AND DISCUSSION

The world is going through the pandemic situation and this situation was first started when the outbreak of corona virus (SARS-CoV-2) was observed in Wuhan, China at the late December of 2019 [1]. The earliest date of symptom was 1st Dec, 2019. Since 1918 the pandemic, the novel human corona virus disease (COVID-19) has become the 5th documented pandemic situation.

The 2019 novel coronavirus (nCoV-2019, known as severe acute respiratory syndrome coronavirus 2, SARS-CoV-2) is a new coronavirus that has never been previously reported in humans [6] has alarming concern. On February 11, 2020, WHO named the disease caused by 2019-nCoV as coronavirus disease 2019 (COVID-19). The diameters of corona viruses are ranging from 65-125 nm contain a single-stranded RNA as a nucleic material, size ranging from 26 to 32kbs in length [7]. Yan et al [8] reported that there are four genera of coronaviruses family- alpha (α), beta (β), gamma (γ) and delta (δ) coronavirus. Among them α- and β-CoV are able to infect mammals, while γ- and δ-CoV to birds. In the early days it was thaught that Human coronaviruses (HCoVs) has relatively harmless respiratory pathogens. However, after the outbreak of the severe acute respiratory syndrome (SARS) and emergence of the Middle East respiratory syndrome (MERS), HCoVs have received worldwide attention. Thereafter, six CoVs have been identified as human-susceptible virus, among which α-CoVs HCoV-229E and HCoV-NL63, and β-CoVs HCoV-HKU1 and HCoV-OC43 with low pathogenicity, cause mild respiratory symptoms similar to a common cold, respectively. The other two known β-CoVs, SARS-CoV and MERS-CoV lead to severe and potentially fatal respiratory tract infections [9]. SARS-CoV-2 is reported as β coronavirus group.

Table 1: Time-table of five pandemic situations since 1918

Year	Virus name	Approx. no. of deaths	Ref. no.
1918	Spanish Flu(H1N1) Influenza A Virus	50 Million	[2]
1957	Asian Flu(H2N2) Influenza A Virus	1.5 Million	[3]
1968	Hongkong Flu(H3N2) Influenza A Virus	1 Million	[4]
2009	Pandemic Flu(H1N1) Influenza A Virus	3 Lakhs	[5]
2019	CoVID-19(SARS-CoV-2) Corona Virus	4.45 Lakhs	

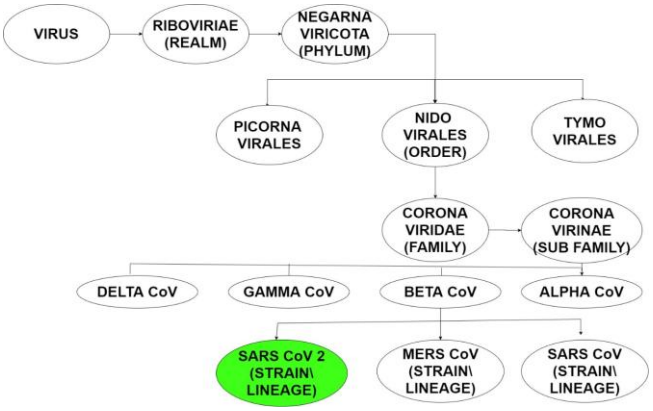

Fig. 1: A Schematic representation from virus to SARS-CoV-2

Coronavirus spike (S) glycoproteins promote entry into cells and SARS-CoV-2 S uses ACE2 to enter cells [10]. From the beginning of the 21st century, three coronaviruses were the cause of deadly pneumonia in humans: severe acute respiratory syndrome coronavirus (SARS-CoV) [11], Middle-East respiratory syndrome coronavirus [12] (MERS-CoV), and SARS-CoV-2 [13]. A common feature of patients of SARS, MERS or COVID-19 is the presence of severe acute respiratory syndrome; however, the estimated fatality rate of COVID-19 (2.3%) is much lower than SARS (~10%) and MERS (~36%) [14, 15].

After infecting by SARS-CoV-2, the clinical symptom was fever, followed by cough, fatigue and dyspnea. The most common comorbidities were hypertension and diabetes, followed by cardiovascular disease and respiratory system disease [16].

From the current evidences it was known that COVID-19 virus is transmitted between people through respiratory droplets and close contacts [17-20].

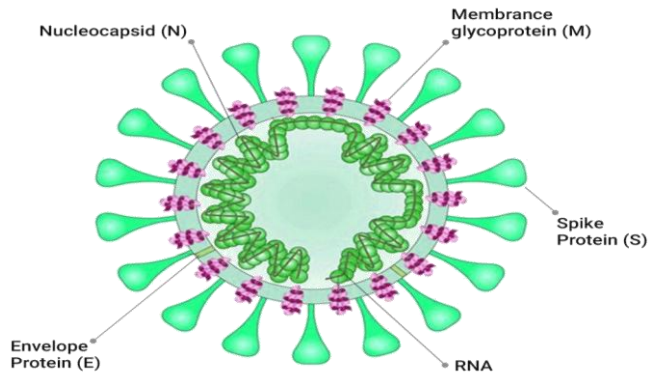

Fig. 2: A structure of Respiratory Syndrome (SARS) coronavirus

To prevent the infection of this virus, there is no medicinal facility or vaccine is available in the market. Only some precautions may reduce the spreading rate of infection e. g., use of face mask, regularly washing of hands by soap, water or by alcohol base hand sanitizer and of course by maintaining social distancing. Garai et al [21] suggested for the use of sodium bicarbonate as an extra protecting agent. One strong hypothesis can be effective in this situation- as SARS-CoV-2 virus mimics the influenza virus (WHO report, 29th April, 2020) regarding clinical presentation, it can be said that immunity power may play a vital role. In general, humans with strong adaptive immune system are less affected by the attack of any influenza virus. To boost the immunity power of humans there are many pathways- daily exercise, not to smoke, intake plenty of water, take essential nutrients, sufficient sleeping etc. Plant-based diet and taking low fat may help to give the immune system a boost. The immune system relies on white blood cells that produce antibodies to struggle against bacteria, viruses, and other invaders. Vegetarians have been shown to have stronger immune system compared to nonvegetarians, due to a high intake of vitamins and low intake of fat [22, 23].

With the early development of bacteria, fungi, eukaryotic cells, plants, higher organisms, and human beings, the fight of organisms against viral attacks has occurred. Lower organisms began to develop innate immune systems [24-27].

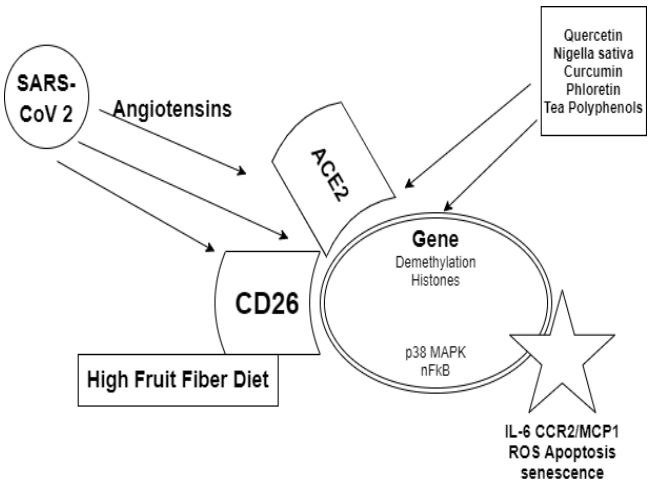

Fig. 3: This is a schematic presentation of virus entry via ACE2 (Angiotensin-converting enzyme 2) and/or CD26 (Dipeptidylpeptidase 4 also known as DPP4).

Consequences for epigenetic regulation of genes involved in inflammation, especially Il-6, apoptosis, and senescence, including prominent intracellular mediators such as p38 MAPK (p38 class of mitogen-activated protein kinase) and transcription factor NF-kB (=nuclear factor 'kappalight-chain-enhancer) [28].

Turmeric is the spice that gives curry its yellow color. It has been used in India for thousands of years as a spice and medicinal herb. Recently, science has started to back up what Indians have known for a long time-it really does contain compounds with medicinal properties [29]. These compounds are called curcuminoids, the most important of which is curcumin. Curcumin is the main active ingredient in turmeric. Chemically, curcumin is a diarylheptanoid, belonging to the group of curcuminoids, which are natural phenols responsible for turmeric's yellow color. It is a tautomeric compound existing in enolic form in organic solvents and in keto form in water. It has powerful anti-inflammatory effects and is a very strong antioxidant. However, the curcumin content of turmeric is not that high. It's around 3%, by weight [30].

There are many reports where it was seen that Curcumin, the main active ingredient in turmeric, has shown antiviral activities against several different viruses, could be a therapeutic option for the management of COVID-19 infection. All of the hypotheses mentioned in this review are based on the thought that the immune responses against COVID-19 are similar to that of other coronaviruses, which should be confirmed by future insights on SARSCoV-2.

Evidence suggests that curcumin has an inhibitory potential against various viral infections. The antiviral effects of curcumin were observed against viruses including HIV, Influenza, HSV-1, HSV-2, etc. virus [31]. Research is going on- a large number of potential therapeutic molecules that include antibiotics, antivirals, and anti-malarials are being tested against COVID-19. Sampangi-Ramiah et al., have evaluated 27 natural compounds for binding affinities to both the proteases of COVID-19 [32]. Prashanth Suravajhala et al. (Preprints, doi: 10.20944/preprints202005.0439.v3) have evaluated the binding affinities of 14 drug candidates with SARSCov-2 proteins: spike glycoproteins (PDB ID: 6VYB), nucleocapsid phosphoprotein (PDB ID: 6VYO), membrane glycoprotein (PDB ID: 6M17) nsp10 (PDB ID: 6W4H) and RNA dependent RNA polymerase (PDB ID: 6M71) structures. They have found that the natural molecule, curcumin from turmeric, has good binding affinities to nucleocapsid and nsp-10, comparable to those of ivermectin, azithromycin and remedesivir. Shah et al. showed the interaction between COVId-19 and an analogue of curcumin and concluded that the curcumin analogue has potency as a lead compound to find new antiviral candidates against COVID-19 for possible therapeutic agents [33]. In a current research (nature research, DOI: 10.21203/rs.3.rs-22057/v1) a study shows fruitful computational interaction between SARS-CoV-2 and curcumin polyphenol and demands as therapeutic/preventive intervention.

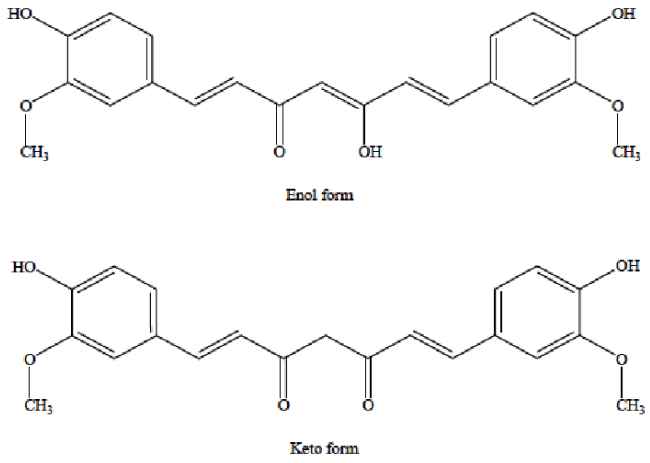

Fig. 4: Chemical structure of Curcumin

2. CONCLUSION

Immune system is essential for our survival. Without an immune system, our bodies would be open to attack from bacteria, viruses, parasites, and more. It is our immune system that keeps us healthy as we float through a sea of pathogens. The immune system is the first-line defense system of our body. So we have to enhance the strength of our immune system i.e., we have to boost our immunity power so that external viral attack can be prohibited. Like other corona viruses SARS-CoV-2 mimics the influenza virus regarding clinical presentation, transmission mechanism, and seasonal coincidence but somewhat new to humans and till now have no medical treatment to prevent its infection. There are several pathways recommended to prevent the spreading of infection- among them, taking healthy, natural and having less side effect ingredient is one of them. Curcumin, an ingredient, can be extracted from Curcuma longa(turmeric) has many bioactive

properties- boosting immunity power is one of them. From above discussion it can be concluded that the hypothesis (use of turmeric to increase immunity power to fight against SARS- CoV-2) matches with the many new research and finding. Hopefully it will give some sunshine for future study against COVID-19.

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