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CORONAVIRUS 2 (COVID-19): EPIDEMIC DISEASE - A REVIEW

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ABSTRACT

Coronavirus-2 belongs to coronaviridae family; the first known severe illness caused by corona virus emerges (2003) as SARS in China followed by second outbreak of severe illness began (2012) as MERS in Saudi Arabia. Further, in December 2019 corona virus outbreak was initiated from the animal such as bat, frogs, snakes, birds, marmots and rabbits and transfer to human being from human seafood market in Wuhan city of China and spread to whole world. The National Health Commission China (Jan 12th, 2020) released coronavirus as epidemic with sign and symptomsfever, dry cough, running nose, sore throat etc. Now coronavirus-2 epidemic disease spread from China to USA and throughout the world. Coronavirus-2 epidemic infected number of peoples, few are recovered and many peoples are died. The data available online in respect to Indian scenario has been highlighted. World Health Organization recommended drugs: Remdesivir, Chloroquine and hydroxychloroquine, Lopinavir and Ritonavir. However, there is no specific drug or vaccines available for coronavirus-2 disease. The leading research Institutes/Universities working on the invention of coronavirus-2 drug throughout the world. In view of the severity of the coronavirus-2 epidemic to pandemic the present paper has highlighted the origin of coronavirus-2 disease, transmission, entry to the human body, mechanism of human coronavirus-2, epidemiology and pathology. WHO report on coronavirus-2 in brief, their potential therapeutic measures including Indian Ayurvedic – prevention measures as well as precautionary measures suggested by scientist are reviewed as a reference material for further studies.

KEYWORDS: Severe Acute Respiratory Syndrome, Covid-19, Receptor-Binding Domain, Middle East Respiratory Syndrome, Indian Ayurveda.

INTRODUCTION

A coronavirus is a group of related viruses belongs to the Coronaviridae family in the order Nidovirales. Coronavirus represents crown like spikes on the outer surface, having minute in size (65-125nm in diameter) and contain a single standard RNA as a nucleic material, size ranging from 26 to 32 kbs in length. Coronavirus can causes illnesses ranging widely in severity. The first known severe illness caused by a coronavirus emerged in 2002 Severe Acute Respiratory Syndrome (SARS) epidemic in China.[1] A second outbreak of severe illness began in 2012 in Saudi Arabia with the Middle East Respiratory Syndrome (MERS).[2] The coronavirus outbreak was initiated from human seafood market in Wuhan city of China and rapidly infected more than 50 peoples.[2] In this market the live animals are frequently sold such as bat, frogs, snakes, birds, marmots and rabbits.[3] In December 2019, it was reported that the virus originated in bats and was transmitted in human through yet unknown intermediary animals in Wuhan, Hubei Province of China. The National Health Commission of China, on 12th Jan, 2020 released further details about the epidemic, suggested viral pneumonia. From the sequence based analysis of isolates from the patients, the virus was identified as novel coronavirus.

The transmission of coronavirus 2

The coronavirus 2 disease is transmitted by inhalation or contact with infected droplets and incubation period ranges from 2 to 14 days. The disease is mild in most people; in some (usually the elderly and those with comorbidities), it may progress to pneumonia, acute

respiratory distress syndrome (ARDS) and multiorgans dysfunction. The human to human spreading of the virus occurs due to close contact with an infected person, exposed to coughing, sneezing, respiratory droplets or aerosols. These aerosols can penetrate to human body (lungs) via inhalation through the nose or mouth. Transmission of the coronavirus 2 from animals to human beings and spread up as epidemic is demonstrated in **Fig. 1**

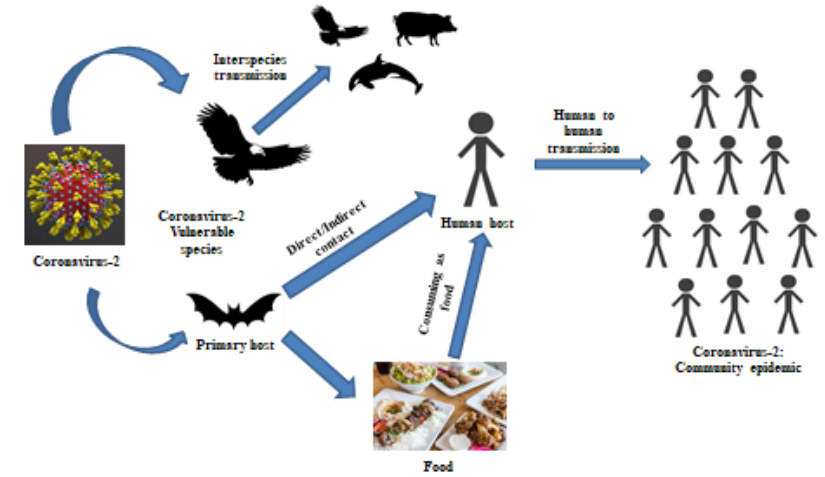

Fig. 1: The key reservoirs and mode of transmission of coronaviruses.

Coronavirus 2: Epidemic spread worldwide

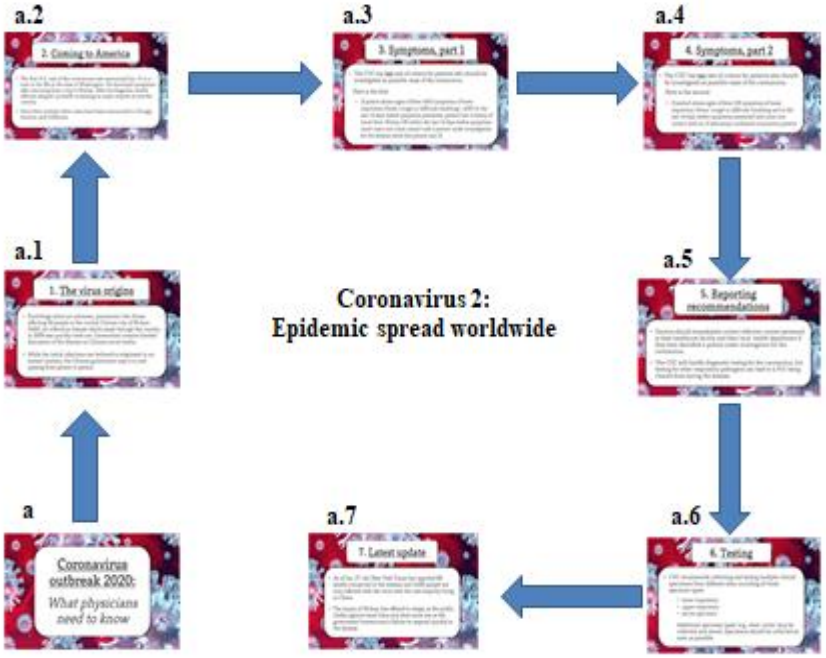

Fig. 2: Coronavirus-2: Epidemic spread worldwide (Coronavirus outbreak 2020: The latest information for doctors; Logan Lutton and Keith A. Reynolds, 2020).

Entry – Mechanism of Human coronaviruses

Coronavirus-2 (particle size: 68 to 124 nm in diameter) may exert a harmful effect, if it comes in contact with a susceptible site in, or on the body. The basic modes of entry into body are through inhalation, skin-adsorption and ingestion.[5]

Inhalation: Inhalation is the most important root of intake of airborne aerosols. The respiratory system serves as the portal of entry into the body for aerosols. The airways from the nasal cavity to the bronchiole are continuously wetted by layer of mucous. The fate of inhaled aerosols mainly depends on physiology and biochemical interaction of the individual.[5]

Skin absorption: The coronavirus-2 aerosols penetration through the skin (transcutaneous) can occur in case of respiratory droplets. Abrasions and irritation also encourage penetration of respiratory droplets. Thus skin act as a barrier to coronavirus-2 respiratory droplets.[5]

Ingestion: Ingestion of the coronavirus-2 occurs through contaminated foods, beverages or putting fingers or other contaminant objects into the mouth. Ingestion occurs where housekeeping is not good or where persons are careless to de-dust their cloths or, wash their hands with soaps.[5]

The viral infection begins with the viral spike glycoproteins attaches to its complementary host cell receptor; after attachment, a protease of the host cell cleaves and activates the receptor-attached spike protein. Depending on the host cell protease available, cleavage and activation allows the virus to enter the host cell by endocytosis or direct fusion of the viral envelop with the host membrane.[4]

Coronavirus-2contain specific genes in ORF1 downstream regions that encode proteins for viral replication, nucleo capsid and spikes formation.[6] The glycoprotein spikes on the outer surface of coronaviruses are responsible for the attachment and entry of the virus to host cells. The receptor-binding domain (RBD) is loosely attached among virus, therefore, the virus may infect multiple hosts.[7,8] The entry mechanism of a coronavirus depends upon cellular proteases which include, human airway trypsin-likeprotease (HAT), cathepsins and transmembrane protease serine 2 (TMPRSS2) that split the spike protein and establish further penetrationchanges.[9,10]

Coronavirus-2(SARS-CoV-2) possesses structure with spike protein and also expressed other polyproteins, nucleoproteins, and membrane proteins, such as RNA polymerase, 3-chymotrypsin-like protease, papain-like protease, helicase, glycoprotein, and accessory proteins.[11,12] The spike glycoprotein of SARS-CoV-2 contains a 3-D structure in the receptor binding domain (RBD) region to maintain the van der Waals forces[13]. The glutamine (at 394 position) residue in the RBD region of SARS-CoV-2 is recognized by the critical lysine 31 residue on the human ACE2 receptor.[14]

Epidemiology and pathogenesis

The coronavirus 2 is a highly transmittable and pathogenic viral infection which emerged from China and spread around the globe. Genomic analysis revealed corona virus 2 is phylogenetically related to severe acute respiratory syndrome-like (SARS-like) bat viruses; therefore bat could be the possible primary reservoir. The intermediate source of origin and transfer to humans is not known, however, the rapid human to human transfer has been confirmed widely.

Studies have shown higher viral loads in the nasal cavity as compared to the throat with no difference in viral burden between symptomatic and asymptomatic people.[15] The virus can remain viable on surfaces for days in favorable atmospheric conditions but are destroyed in less than a minute by common disinfectants like sodium hypochlorite, hydrogen peroxide etc.[16] Infection is acquired either by inhalation of these droplets or touching surfaces contaminated by them or then touching the nose, mouth and eyes. The virus is also present in the stool and contamination of the water supply and subsequent transmission via aerosolization /feco oral route is also hypothesized.[17] As per current information, transplacental transmission from pregnant women to their fetus has not been described.[18]

Coronavirus-2 burden in India

Coronavirus -2 State wise status (As on: 14th April, 2020, (https://www.mygov.in/corona-data/covid19-statewise-status).

S. No.	Name of the State	Total confirmed cases	Total cured / discharged	Total death
1.	Andhra Pradesh	432	11	7
2.	Andaman Nicobar	11	10	0
3.	Assam	31	0	1
4.	Arunachal Pradesh	1	0	0
5.	Bihar	65	26	1
6.	Chandigarh	21	7	0
7.	Chhattisgarh	31	10	0
8.	Delhi	1510	30	28
9.	Gujarat	539	54	26
10.	Goa	7	5	0
11.	Haryana	185	29	3
12.	Himachal Pradesh	32	13	1
13.	J & K	270	16	4
14.	Jharkhand	24	0	2
15.	Kerala	379	198	3
16.	Karnataka	247	59	6

17.	Ladakh	15	10	0
18.	Madhya Pradesh	604	44	43
19.	Maharashtra	1985	217	149
20.	Manipur	2	1	0
21.	Mizoram	1	0	0
22.	Odisha	54	12	1
23.	Puducherry	7	1	0
24.	Punjab	167	14	11
25.	Rajasthan	873	21	3
26.	Tamilnadu	1173	58	11
27.	Telangana	562	100	16
28.	Uttar Pradesh	558	49	5
29.	Uttarakhand	35	5	0
30.	Tripura	2	0	0
31.	West Bengal	190	36	7
32.	Nagaland	1	0	0

WHO global report

Coronavirus is infectious disease, older people and those with underlying medical problems like Cardiovascular disease, diabetes, chronic respiratory disease, and cancer are more susceptible to develop serious illness.Covid-19 virus affects different people in different ways...causes Respiratory disease, and most infected people develop mild to moderate symptoms and recover without special treatment.

***Common symptoms*:** Fever, tiredness, dry cough

Other symptoms include: shortness of breath, aches and pains, sore throatand very few people will report diarrhoea, nausea, or a running nose.People with fever, cough or difficulty breathing should call their doctor and seek medical attention. WHO: has initiated a global mega trial of the four most promising drugs that may cure the Novel coronavirus.

WHO- is focusing on: an experimental antiviral compound called Remdesivir, malaria medications Chloroquine and hydroxychloroquine combination of two HIV drugs, Lopinavir and Ritonavir : and that same combination plus interferon-beta, an immune system messenger that can help cripple viruses.

At this time, there are no specific vaccines or treatment for Covid -19, However, there are many ongoing clinical trials evaluating potential treatments, WHO will continue to provide updated information as soon as clinical findings become available.Best way to prevent and slow down transmission is be well informed about Covid-19 virus, the disease it causes and how it spreads.Protect yourself and others from infection by washing your hands or using an alcohol based rub frequently and not touching your face.

Prevention

To prevent infection and to slow transmission of Covid -19, do the followings:

- Wash your hands regularly with soap and water, or clean them with alcohol based hand rub
- Maintain at least 1 meter distance between you and people coughing or sneezing
- Avoid touching your face
- Cover your mouth and nose when coughing and sneezing
- Stay home if you feel unwell
- Refrain from smoking and other activities that weaken the lungs
- Practice physical distancing by avoiding unnecessary travel and staying away from large group of people.
- Healthy immune system will help in recovery from the coronavirus infection.

Potential therapeutics

Initially, interferons-a nebulization, broad-spectrum antibiotics, and anti-viral drugs were used to reduce the viral load,[19-21] however, only remdesivir has shown promising impactagainst the virus.[22] Remdesivir and chloroquine combination or interferon beta significantly blocked the SARSCoV-2 replication.[23-25] Various other anti-virals are currently being evaluatedagainst infection. Nafamostat, Nitazoxanide, Ribavirin, Penciclovir, Favipiravir, Ritonavir, AAK1, Baricitinib, and Arbidol exhibited moderate results when tested against infection inpatients and in-vitro clinical isolates.[24,26,24,25] Several othercombinations, such as combining the antiviral or antibiotics withtraditional Chinese medicines were also evaluated against SARSCoV-2 induced infection in humans and mice.[24]

The major Research Institutes/Universities - working for invention of drug against Coronavirus-2.

S. No.	Platform	Type of Vaccine candidate	Developer	Coronavirus target	Current stage of clinical evaluation
1.	Non-replicating viral vector	Adenovirus Type 5 vector	CanSino Biological Inc./Beijing Institute of Biotechnology	Covid-19	Phase I
2.	RNA	LNP-encapsulated mRNA	Moderna/NIAID	Covid-19	Phase I
3.	DNA	DNA plasmid vaccine	Inovio Pharmaceuticals	Covid-19	Pre-clinical
4.	DNA	DNA plasmid vaccine	ZydusCadila	Covid-19	Pre-clinical
5.	Live Attenuated	Deoptimized live attenuated vaccines	Codagenix/Serum Institute of India	Covid-19	Pre-clinical
6.	Non-replicating viral vector	ChAdOx1	University of Oxford	Covid-19	Phase I/II (not yet recruting)
7.	Protein subunit	RBD or S1 protein	Baylor College of Medicine	Covid-19	Pre-clinical

Indian Ayurvedic recommendation for prevention measures

"PREVENTION is Better than CURE"

Covid-19 our break- entire mankind across the Globe is suffering. Natural defense system - Immunity plays an important role in maintaining SOUND HEALTH.

Recommended measures

1. General Measures

- Drink warm water throughout the Day
- Daily practice: Yoga, Pranayama, and Meditation at least 30 minutes
- Cooking: USE-Spices like Haldi (Turmeric), Jeera(Cumin), Dhaniya (Coriander), and Lahsun (Garlic)

2. Immunity Promoting Measures- (Ayurvedic)

- TEA: Drink Harbal TEA - Prepared with Tulsi (Basil), Dalchini (Cinnamon), Kalimirchi (Black pepper), Shanthi (Dry Ginger) and Munakka(Raisin)- one or twice a day.....Add Jaggery(natural Sugar) and / or fresh lemon juice , if needed to your taste..

-Milk: make Golden Milk - add half tea spoon Haldi(Turmeric) powder in 150 ml hot milk once or twice a day..

3. Ayurvedic Procedures- for prevention

-NASAL: Apply sesame oil / coconut oil or Ghee in both the nostrils (PratimarshNasya) - morning and evening, daily

-Oil pulling therapy:

Take 1 table spoon sesame or coconut oil in mouth, do not drink, and swish in the mouth for 2-3 minutes and spit it off ... followed by warm water rinse....; once or twice in a day..

4. Remedial measures-

During Dry cough / Sore throat

-Steam inhalation with fresh Pudina (Mint) leaves or Ajwain (Caraway seeds) ... practice once in a day..

-Lavang (Clove) powder mixed with natural sugar / honey can be taken 2-3 times in a day..

NOTE: 1.The above measures can be followed to the extent possible as per an individual's convenience...

2. These measures generally treat normal Dry cough and Sore throat.

3. However, it is best to consult doctors, if these symptoms persist.

4. Ayurvedic measures: Boosting Immunity for Self Care – duringCOVID-19

Johns Hopkins University - summary to avoid coronavirus-2 infection

- The virus is not a living organism, but a protein molecule (DNA) covered by a protective layer of lipid (fat), which, when absorbed by the cells of the ocular, nasal or buccal mucosa, changes their genetic code. (mutation) and convert them into aggressor and multiplier cells.
- Since the virus is not a living organism but a protein molecule, it is not killed, but decays on its own. The disintegration time depends on the temperature, humidity and type of material where it lies.
- The virus is very fragile; the only thing that protects it is a thin outer layer of fat. That is why any soap or detergent is the best remedy, because the foam CUTS the FAT (that is why you have to rub so much: for 20 seconds or more, to make a lot of foam). By dissolving the fat layer, the protein molecule disperses and breaks down on its own.
- HEAT melts fat; this is why it is so good to use water above 25 degrees Celsius for washing hands, clothes and everything. In addition, hot water makes more foam and that makes it even more useful.
- Alcohol or any mixture with alcohol over 65% DISSOLVES ANY FAT, especially the external lipid layer of the virus.
- Any mix with 1 part bleach and 5 parts water directly dissolves the protein, breaks it down from the inside.
- Oxygenated water helps long after soap, alcohol and chlorine, because peroxide dissolves the virus protein, but you have to use it pure and it hurts your skin.
- NO BACTERICIDE SERVES. The virus is not a living organism like bacteria; they cannot kill what is not alive with anthobiotics, but quickly disintegrate its structure with everything said.
- NEVER shake used or unused clothing, sheets or cloth. While it is glued to a porous surface, it is very

inert and disintegrates only between 3 hours (fabric and porous), 4 hours (copper, because it is naturally antiseptic; and wood, because it removes all the moisture and does not let it peel off and disintegrates), 24 hours (cardboard), 42 hours (metal) and 72 hours (plastic). But if you shake it or use a feather duster, the virus molecules float in the air for up to 3 hours, and can lodge in your nose.

- The virus molecules remain very stable in external cold, or artificial as air conditioners in houses and cars. They also need moisture to stay stable, and especially darkness. Therefore, dehumidified, dry, warm and bright environments will degrade it faster.
- UV LIGHT on any object that may contain it breaks down the virus protein. For example, to disinfect and reuse a mask is perfect. Be careful, it also breaks down collagen (which is protein) in the skin, eventually causing wrinkles and skin cancer.
- The virus CANNOT go through healthy skin.
- Vinegar is NOT useful because it does not break down the protective layer of fat. NO SPIRITS, NOR VODKA, serve. The strongest vodka is 40% alcohol, and you need 65%.
- LISTERINE IF IT SERVES! It is 65% alcohol.
- The more confined the space, the more concentration of the virus there can be. The more open or naturally ventilated, the less.
- This is super said, but you have to wash your hands before and after touching mucosa, food, locks, knobs, switches, remote control, cell phone, watches, computers, desks, TV, etc. And when using the bathroom.
- You have to HUMIDIFY HANDS DRY from so much washing them, because the molecules can hide in the micro cracks. The thicker the moisturizer, the better.
- Also keep your NAILS SHORT so that the virus does not hide there.

CONCLUSION

Coronavirus-2 is not a living organism but a protein molecule having single stranded RNA as a genetic material. When absorbed by the cell/nasal/buccal mucosa of the living organism changes their genetic code (mutation) and converts into aggressor and multiplier cells. The disease caused is called coronavirus-2 disease. Coronavirus-2 outbreak was initiated from animals sold in human seafood market, Huwan city of China and transmitted to the human being. Coronavirus-2 epidemic spread up into whole world and the cases of (i) the infected persons (ii) persons recovered from the infection and (iii) death reportedare cited. WHO recommended Remdesivir, Remdesivir and chloroquine combination and Lopinavir and Ritonavir potential drugs; however there are no specific drugs or vaccines invented for coronavirus-2 disease.

This review paper gives the first hand report on coronavirus-2 (Covid-19), its origin, transmission, entry and mechanism, epidemiology and pathogenesis, potential therapeutics; WHO status report also included. The Indian Ayush Ministry directives are also cited for preventive measures to be taken against coronavirus-2 infection. This paper will help the society to understand coronavirus-2 epidemic and scientist to invent remedial measures.

Conflict of Interest: None.

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