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Evolution, Ayurveda, immunity, and preventive aspects for emerging infectious diseases such as COVID-19

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ABSTRACT

Evolution is a continuous process of changes in structural and physiological mechanism in the living being. Microbes/pathogens can evolve naturally or artificially and become resistant to various medicines. The novel corona virus is such evolved pathogen of corona virus group. Enough strong immunity is needed to prevent or survive from COVID-19 pandemic. Ayurveda provides ways for evolving physiological responses to built immunity. Present work is a brief attempt to increase insight in this filed. Present review was done based on the simple theory of evolution, recent updates regarding prevention of COVID-19, Ayurveda aspect toward infectious diseases and Ayurveda ways towards prevention of infectious diseases with special reference to COVID-19. Person with impaired immunity is more susceptible for COVID-19 and thus immunity is an important preventing factor. Ayurveda *Rasayana* (rejuvenation) herbs, Yoga exercises, *Pranayama* (special breathing exercise), daily regimens and personal hygiene guidelines can be helpful strategies in controlling the spread of COVID-19. The preventive aspects of pandemic situations are narrated in Ayurveda with enough details. They need to be scientifically explored and refined for precision. As prevention is always better than cure, Ayurveda ways can be considered for future strategies to avoid pandemics such as COVID-19. There is a great need for research on Ayurveda medicines on COVID-19 like diseases.

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INTRODUCTION

It can't be an exaggeration to mention that almost all visible living species on the earth are surrounded by tiny species which are invisible to naked eyes

and those are called as micro-organisms. Few species of micro-organisms are living synergistically in the body of macro-organisms. On the other hand, few species are responsible for causing various illnesses in immunocompromised or even in healthy ones. The human body is not an exemption to this. The human body is a host for micro-organisms such as Bacteria [*Actinomyces viscosus*, *Cyanobacteria*, *A.naeslundii*, lactobacillus species etc. (Sommer and Bäckhed, 2013)], Archaea [*Methanobrevibacter smithii*, *Methanosphaera stadtmanae* etc. (Florin, 2000)], Fungi [e.g. *Candida* species (Martins et al., 2014)], and Viruses [Aichi virus, Cosavirus A, Dengue virus, Hepatitis A, B, C, and E virus etc.]. (Viralzone, 2020)]

Every living species on the earth is continuously in contact with such micro-organisms no matter

whether the species is aquatic, amphibian, or terrestrial. According to Darwin's theory of "Survival of the fittest", it is clear that all these microbes are constantly engaged in a war to overcome the immunity of the host to live and reproduce. Similarly, the body of the host (macro-organisms/human/animal) is also fighting the war and this war sharpens its immunity. In other words, there is a continuous evolution in all living organisms to develop physiological mechanisms required for survival. However, it is clear that the process of evolution is very slow, and it requires a longer duration to cause even the smallest physiological or anatomical change. For example, 1% change in the amino acid sequence requires 20 million years (National Academy of Sciences, 1999). This rate increases with an increase in the rate of reproduction. In other words, smaller the animal more will be the reproduction rate and faster will be the process of evolution (LaBar and Adami, 2016). In simple terms, mankind is evolving and also facing the evolving world of micro-organisms.

The recent outbreak of Anthrax, H1N1, SARS, and novel corona virus has highlighted the risk caused by genetically engineered viruses in various virology laboratories. Indeed, there are few significant positive outcomes from such researches, but the risk cannot be ignored. Ayurveda clearly states that properties and applications of knowledge, vapors, and water are depending on who is holding them. Ayurveda has already discovered and strongly recommended living harmonically with the rules of nature, and the same way has been found applicable in the pandemic conditions caused by the new strains of viruses. The *Rasayana* (rejuvenating drugs) of Ayurveda are significantly helpful in strengthening the immune system and thereby offers a natural way for the prevention of pandemic diseases. Considering these aspects, an attempt has been made to present the relationship between evolution in living beings, Ayurveda, and prevention of emerging infectious diseases such as COVID-19.

MATERIAL AND METHODS

The present review was done based on the simple theory of evolution, recent updates regarding prevention of COVID-19, Ayurveda aspect towards infectious diseases, and Ayurveda ways towards prevention of infectious diseases with a special reference to COVID-19. Information collected from WHO, Ministry of AYUSH, news updates, and opinions of experts are utilized as sources for this review. As immune-compromised persons have a higher risk of COVID-19, the herbal *Rasayana* drug, which has proven immunomodulatory activity, is also com-

pared in the present study. Review of Ayurveda formulations which might help in the prevention and cure of COVID-19 is intentionally avoided due to lack of direct strong scientific evidence.

Observations and Results

Since the 18th century, the world has faced 13 pandemics caused by different viruses and resulted in a few thousand to million deaths (Table 1). The world is currently facing COVID-19, and most of the countries have been completely locked down to stop the spreading of the infection. The death rate due COVID-19 is the highest among ecumenically top countries with the best health facilities such as Italy (16,523), Spain (13,798), USA (10,943), and France (8,911) (Worldometers, 2020). Personal hygiene, social isolation, few Yoga exercises, and administration of immunity booster medicines are the preventives aspects (Lepan, 2020). The detailed treatment guidelines for mild to severe symptoms of COVID-19 have been provided by the WHO on March 13, 2020 (World Health Organization, 2020). Considering the significant role of immunity in the prevention of COVID-19, the Ministry of AYUSH, Government of India has published guidelines for Ayurveda's immunity-boosting measures for self-care during COVID-19 crisis (Ministry of AYUSH, 2020). In Ayurveda, there are 27 commonly utilized herbs which have proven immunomodulatory activity (Table 2). Few Ayurveda daily practices which are very easy to follow are depicted in Table 3. These practices may help avoid exposure, reduce risk, and increase local (at the skin) and general immunity, which are major aspects for the prevention of COVID-19.

Discussion

It is clear from the history of infectious diseases that pandemic infectious diseases such as COVID-19 are results of evolved viruses. The evolution is either nature by law of survival of the fittest or by artificial i.e. by induced by research laboratories with aim to find solution for some diseases. In both case it is vivid that the micro organisms are evolved but not human beings. Neither immunity nor the daily life of human beings is prepared to fight against such infections. It is because of the too much increased dependence on medicines and very less focus on development of body. This is where Ayurveda holds its far major focus compared to other medical sciences. According to Ayurveda principles, prevention of diseases by increasing immunity is of first priority and second priority is given to treating the disease. The distinguishing feature of Ayurveda in increasing body strength is the utilization of simple daily ways most of which are without medicines. For

Table 1: All major pandemic diseases occurred from 18th century till date

S.N	Name	Time period	Type / Pre-human host	Death toll
1	Cholera Pandemics	1817-1923	V.cholerae bacteria	1M+
2	Third Plague	1885	Yersinia pestis bacteria / Rats, fleas	12M (China and India)
3	Yellow Fever	Late 1800s	Virus / Mosquitoes	100,000-150,000 (U.S.)
4	Russian Flu	1889-1890	Believed to be H2N2 (avian origin)	1M
5	Spanish Flu	1918-1919	H1N1 virus / Pigs	40-50M
6	Asian Flu	1957-1958	H2N2 virus	1.1M
7	Hong Kong Flu	1968-1970	H3N2 virus	1M
8	HIV/AIDS	1981-present	Virus / Chimpanzees	25-35M
9	Swine Flu	2009-2010	H1N1 virus / Pigs	200,000
10	SARS	2002-2003	Coronavirus / Bats, Civets	770
11	Ebola	2014-2016	Ebolavirus / Wild animals	11,000
12	MERS	2015-Present	Coronavirus / Bats, camels	850
13	COVID-19	2019-Present	Coronavirus	70,600 (April 6)

M=Million,M+= More than a million

Preventive measures	Curative measures
Medicated water for drinking	<p>There is no evidence regarding which Ayurveda formulation is able to cure COVID-19. Many Ayurveda experts has claimed few combinations but here no claim can be add in absence of supportive scientific evidence.</p> <p>However it is recommendable to study the effect of formulations such as Tribhuvankirti Rasa, Paripathadi Kwath, Samirapannaga Rasa, Kalingadi Kashaya, Mallasindoor, Lakshmivilas Rasa, Vyaghri Haritaki Avaleha</p>
Medicated water for bath	
Yoga such as <i>Suryanamaskar</i> , <i>Halasana</i> , <i>Chakrasana</i> to reduce mucus from respiratory system	
Yoga such as <i>Bhastrika</i> , <i>Ujjayi</i> , <i>Anulom-Vilom</i> , to increase total lung capacity	
Use of formulations prepared from <i>Rasayana</i> Herbs	
Exposure to morning sunlight	
Home <i>Dhupana</i> (medicated fomentation)	
Meditation to increase self awareness and positive attitude to cope with pandemic situation	

Figure 1: Probable helpful Ayurveda measures for COVID-19 crisis

Table 2: Herbs which have proven immunomodulatory activity

S.N.	Plant Name	Part used	S.N.	Plant Name	Part used
1	Hibiscus rosasinensis <i>Gaur et al. (2009)</i>	Flowers	15	Asparagus racemosus <i>Patil et al. (2009)</i>	Root
2	Cleome gynandra <i>Bawankule et al. (2007)</i>	Aerial parts	16	Boerhaavia diffusa <i>Shukla et al. (2009)</i>	Whole plant
3	Tinospora cordifolia <i>Kumar et al. (2012)</i>	Stems	17	Curcuma longa <i>Jayathirtha and Mishra (2004)</i>	Balb
4	Balanite roxburghi <i>Patil et al. (2010)</i>	Leaf	18	Eclipta alba <i>Schepetkin et al. (2009)</i>	Whole plant
5	Aloe vera <i>Sharififar et al. (2009)</i>	Leaves	19	Mangifera indica <i>Kim et al. (2009)</i>	Stem bark
6	Picrorhiza scrophulariiflora <i>Shrivastav (2011)</i>	Whole plant	20	Withania somnifera <i>Davis and Kuttan (2000)</i>	
7	Tinospora cordifolia <i>Jeba et al. (2011)</i>	Stem	21	Azadirachta indica <i>Awah (2011)</i>	Leaf
8	Ocimum sanctum <i>Ghaisas et al. (2009)</i>	Whole plant	22	Boswellia carterii <i>Badria et al. (2003)</i>	Bark
9	Bauhinia variegata <i>Thakur et al. (2007)</i>	Stem bark	23	Tinospora cordifolia <i>Aher and Wahi (2010)</i>	Stem
10	Citrus aurantifolia <i>Bafna (2010)</i>	Fruits	24	Emblica officinalis <i>Madhuri et al. (2011)</i>	Fruit
11	Tinospora cordifolia <i>Lu et al. (2007)</i>	Whole plant	25	Centella asiatica <i>Puncturee et al. (2005)</i>	Whole plant
12	Aloe vera <i>Lu et al. (2007)</i>	Leaves	26	Piper longum <i>Sunila and Kuttan (2004)</i>	Fruit
13	Allium sativum <i>Naik and Hule (2009)</i>	Whole plant	27	Terminalia arjuna <i>Bachawat et al. (2011)</i>	Bark
14	Andrographis paniculata <i>Gautam et al. (2009)</i>	Whole plant			

example daily Yoga exercise, rules regarding diet, personal hygiene's, guidelines regarding awaking as well as sleeping etc. These ways helps in maintaining strength of body (immunity) which in turn helps in combating pandemic conditions such as COVID-19.

Ayurveda has clearly narrated pandemic diseases under the heading *Janapadodhwansa*. The cause varies but the medium through which such pandemics spread are same which humanity has faced in the history of pandemic i.e. water, air, soil and living beings. Ayurveda has recommended boiling of water before its utilization for any purpose (disinfection of water), *Yadnya's* (rituals done with hymens in front sacred fire) were done to control spread of air born infections. Cow urine mixed with

ash of specific herbs was utilized to control infection spreading through soil. Simple daily regiments which are depicted in Table 3 Ayurveda daily regiments three are followed to avoid infection through contact. Therefore it can be claimed that Ayurveda deals with evolving physiological functioning of body and mind towards strengthening immunity and thereby prevention of pandemic infections such as COVID-19. Brief Ayurveda modalities for prevention of COVID-19 are depicted in Figure 1. These modalities have limitation that their exact extent of utility is not known and it can be discovered by undertaking retrospective survey studied during or after the pandemic is over.

COVID-19 and evolution

Human corona virus has been known since long time

Table 3: Ayurveda daily practices for prevention of COVID-19

S.N.	Ayurveda Practice	Correlation	Significance
1	Hasta-Pada Dhavan	Washing of hand and legs when came from outside or any guest who came at others home	To avoid spread of infection which one gets from outside*
2	Aushadhi youkta Jala Snana	Bathing by using medicated water such as by adding leaf of Azadirachta indica (Neem)	Body disinfection through water soluble extracts of medicated herbs which is similar to use of soap
3	Abhyanga	Whole body massage by medicated oil	Same as above. It also strengthen skin by increasing blood flow. The sweating caused during massage help to remove toxins from blood.
4	Kavala-Gandusha	Mouth rinses and gargles	Cleansing effect on oral cavity as well removes extra mucous. Coronaviruses are abundant in nasal and mouth mucosa, removing them may decrease severity of SARS
5	Nasya	Medicated nasal drops	Disinfection of nose as well as reaches to blood stream and also helps in decreasing respiratory manifestations
6	Trividha Kukshi Ahara	Leaving 1/4th part of stomach empty for digestion	Improves metabolism and thereby nutrition of body and thus increases immunity which an important factor for prevention of COVID-19

*Also recommended by WHO

but the RNA of the current pandemic causing virus has been evolved and thus it has been resistant to the medicines which are generally indicated for human corona virus. The fact highlight that there is faster process of evolution among microbes either in artificial or natural environment. In fact, the industrialization done by human has much changed the environment. It is simple assumption that body of every living organism is attempting to adopt with these changes. However, in case of human beings, the assumption varies based on developmental state of individual countries. The well developed countries have enough facilities to avoid continuous long contact with changed environment and thus peoples of such countries have less chances or slower rate of adoption. On the other hand peoples of developing and underdeveloped countries are living more with nature. The difference in incident and mortality rate among developed, developing and under developed countries is supportive of the assumption of adoption. Ayurveda emphasizes on utilization of natural resources in natural forms and living with nature. In

other words, Ayurveda recommends ways for adoption and thereby evolution to make us enough suitable to face pandemics.

The *Rasayana* (rejuvenating anti-oxidant and immunomodulator) herbs

Large numbers of immunomodulator herbs has been discovered and readily available in Ayurveda treatise. Few of the selected herbs are compiled in Table 2, on which scientific researches on immunomodulatory action has been done with positive results. This is significant gift of Ayurveda to increase the immunity especially in current pandemic situation for the healthy individuals. Administration of these herbs in specific dosage forms or the formulations prepared from them under Ayurveda physicians guideline can be a strong measure for prevention of further spread of COVID-19 among healthy individuals. In other words, *Rasayana* herbs can be a strong effective tool in avoiding as well as fighting stage third of this pandemic.

Yoga exercises, immunity and respiratory system

One of the significant contribution of Indian ancient seers is the discovery of Yoga. Actually Yoga is systematic slow exercise which exerts slow but steady stress among all vital organs. In other words, Yoga is a way to strengthen vital organs and the immunity depends on normal functioning of all these vital organs. *Pranayama* includes several types of Yoga which are related to respiration such as *Bhastrika* (forceful fast breathing), *Anuloma-Viloma* (sequential breathing by alternate closing of each nostril), *Ujjayi* (ocean breath), *Sitali* (the cooling breath) etc. All these *Pranayam* are helpful in cleaning the excess mucus accumulated in bronchial alveoli and helps in increasing their elasticity. It means *Pranayama* is a tool to increase total lung capacity. In case of COVID-19, SARS is an sever manifestation which is the cause for death. Therefore claim can be made that a person is likely to manifest SARS in less sever extent if he/she have better lung capacity. This will give chance and enough time to mangle COVID-19 by the available medications and life saving care. Hence it can be strongly advisable to include *Pranayama* in preventive strategies suggested for COVID-19.

Focusing on future

It is very hard and risky to prepare for a war when the actual war has begun. Those who cares for safety always make arrangements before emerging the problem. Currently world is facing COVID-19 pandemic and thus it is difficult to follow preventive guidelines and ensuring the safety. Ayurveda guidelines offers a way to prepare mankind to get possible safety in current situation but these guidelines promises much more safety in prevention of similar pandemic in future. Along with fighting current situation, the scientific minds in the word are expected to start preparing strategies for future too. Ayurveda can play significant role in future strategies because most of the preventive strategies for COVID-19 has clearly showed that the ancient seers of Ayurved had already provided those guidelines and few more too which are yet to be accepted and recommended by world scientific committees.

CONCLUSION

Cure of an illness matter much more but prevention is always better than cure. Ayurveda offers simple natural ways (daily regimens), herbal combinations, herbo-mineral formulation and exercises such as Yoga for prevention of COVID-19. The curative role of Ayurveda needs to be systematically studied. However based on the precision in Ayurveda prin-

ciples, it can be claimed that Ayurveda may have a definite cure for COVID-19 and there is great need to find and establish it.

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Conflict of Interest

There is no conflict of interest.

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