



## Management of COVID-19: Ayurvedic perspective

Y B Tripathi<sup>\*†</sup>, N Joshi, S K Dubey, P S Byadgi, S Bhat, R Prasad, B K Dwivedi, K K Pandey, J S Tripathi, C S Pandey, K H H V S S N Murthy, S Suman, A K Pandey, V Srivastava, V Jaisawal & K N Dwivedi<sup>§</sup>

Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, Varanasi 221 005, India

E-mail: <sup>†</sup>yamini@bhu.ac.in; <sup>§</sup>kndbhu@gmail.com

Received 01 June 2020; revised 13 June 2020

*Ayurveda*, a branch of AYUSH system of health care in India is considered as alternative/complementary of medicine (CAM) in WHO. Here, its products are covered under “drug and cosmetics” act but in abroad they are supplements or functional foods. The aim of *Ayurveda* is to maintain the wellness of a healthy person and to treat a patient. For treatment, *Ayurveda* adopts 3 approaches i.e., (1) *Daivavyapasharya* (दैवव्यपाश्रय) *chikitsa* (2) (ypareht enivid *Yuktivyapashraya* (युक्तिव्यपाश्रय) *chikitsa* (Rational therapy) 3 *Satvavajaya* (सत्वावजय) *chikitsa* (Psychotherapy) and focuses to enhance the *Vyadhikshmatva* (capacity to fight against spread of pathogenesis by strengthening all 7 *dhatu*s (*rasa, rakta, meda, mansa, asthi, majja* and *shukra*). The disease COVID-19 falls under “*Bhootvidya* (GrahaVidya)”, which is one of the 8 branches of “*Astanga Ayurveda*”. It is an “*Agantuja*” disease, where the disease symptoms appear in 1<sup>st</sup> stage followed by its spread in the body. Thus, progress of disease (*Samprapti*) has been considered under concept of *shatkriyakala* (6 stages of disease development), which has been given high importance for deciding the stage of disease progress and its treatment protocol. Here, we have described the introduction to *Astanga Ayurveda*, concept of disease pathogenesis and holistic approach of treatment in respect to management of COVID-19. It specifically covers symptom based stage of disease progress and its targeted treatment guideline by including all 3 approaches of treatment, described above. Here, the current line of diagnosis, treatment and research related to COVID-19 management has been included, which are reported by basic scientists and physicians of allopathic system. These are indexed in Pubmed and web of science and also described in classical text books of *Ayurveda*. The same has been reviewed and summarized here, with an objective of possible correlation between the 2 languages of science of health care.

**Keywords:** *Astang Ayurveda*, Ayurvedic-guideline, *Bhootvidya*, COVID-19, Treatment- protocol

**IPC Code:** Int. Cl.<sup>20</sup>: A61K 9/00, A61P 37/02, A61K 45/06

The management of COVID-19 patient's-guideline, developed and released by WHO, is being followed all over the World by doctors of conventional system of medicine. However, *Ayurveda*, one of the AYUSH systems, in India, needs a definite guideline and protocol for management of these patients. *Ayurveda*, an ancient science of life, has its own drug-formulary, line of diagnosis and treatment, based on principles of *Astanga Ayurveda*. It is in practice, since centuries, across the country, with a huge network of its physicians and surgeons. The COVID -19 is a pandemic condition caused due to novel coronavirus (2019-nCoV), now called as Severe Acute Respiratory Syndrome Corona Virus -2 (SARS CoV 2). Since the report of the first case of the COVID-19 pandemic in India on 30<sup>th</sup> January 2020, the Ministry of Health and Family Welfare have confirmed a total of 134,823 cases, 57720 recoveries and 4021 deaths in the country as on dated 25.05.2020<sup>(ref. 1)</sup>.

\*Corresponding author

### Pathogenesis of COVID-19

SARS-CoV -19 comes under Human coronaviruses (HCoV)s. Its spike's protein consists of S protein, having domains: S1 and S2, which binds to receptors on the host cells. The CoVs are RNA viruses belonging to the family of Coronaviridae<sup>2</sup>. Up to now, 6 strains of viruses have been identified. These are HCoV-229E, HCoV-NL63, HCoV-OC43, HCoV-HKU1, severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV)<sup>3</sup>. As per existing literature, the CoV attaches itself to host cell through its spike having S1 protein and triggers host's cell-membrane hydrolysis, resulting fusion of virus with the host cell, through the S2 domain. The host cell receptors include (1) aminopeptidase N (2) Angiotensin converting enzyme-2 (ACE-2), dipeptidylpeptidase-4 (DPP-4) & 9-O acetylated sialic acid.

Primarily, it attacks the respiratory system, but it has potential to affect other organs also, because of

versatile availability of these host receptors. In span of 21 days, its early-stage is asymptomatic, but at later stage, slowly symptoms of fever, cough, fatigue, dyspnea, shortness of breath appears. At later stage, up 7-14 days, symptoms of pneumonia and bronchitis may appear in a few cases, but in most cases the symptoms and viral load disappear within 14 to 21 days<sup>4</sup>. Some patients undergo uncontrolled host-immune response, leading to a life-threatening condition of cytokine release syndrome (CRS). It is more severe in those people who have cardiometabolic, diabetes mellitus, obesity, arterial hypertension. The lymphopenia and high procalcitonin are reported in children. After attack, it induces various biochemical activities in the host cell by involving several signaling pathways e.g. MAP kinases, NFkB etc, which result in apoptosis of the host cell<sup>5</sup>. By using transcription profile and bioinformatics tools, drug docking of anti-signature perturbation analysis the role of inhibitors of MAP kinases, serine-threonine kinase, mammalian target of rapamycin (mTOR) and I kappa B Kinase (IKK) can be used to develop new drugs. Thus, these molecules may be used as target for developing new drugs in addition to the development of vaccines. Researchers are moving towards repurposing of existing drugs for flu influenza, BCG vaccine, drugs for other metabolic disorders, but in this direction phytochemicals from various medicinal plants are also being explored through bioinformatics, drug docking and simulation tools. The potent inhibitors of the host enzyme TMPRSS2 is also in progress<sup>6</sup>. The lead is being taken from the list of drugs, which are already in use for treatment of symptoms, appearing in patients of COVID-19. No proven and effective therapy for SARS-CoV-2 has been reported till date. The currently antiviral drugs, biological response modifiers and inhibitors of RAAS are being explored. The drugs, diet modification or physiological changes, which may influence the expression or activity of ACE-2 proteins is mainly being explored as a new drug. In this series, several synthetic molecules and also phytochemicals of different plants are being tested by bioinformatics tools. The hydroxychloroquine (HCQ) has speeded up COVID-19 virus clearance as measured by Real time Polymerase chain reaction (RT-PCR) data in experiments, but meta-analysis of several trials showed negative results in several clinical trials. Even the total death was also more. Chloroquine

compounds get accumulated in the endolysosomal system and raise the pH, which we hypothesize would counteract HMGB1 from operating as a detergent and thus preclude leakage of DAMP/PAMP molecules to the cytosol<sup>7</sup>. Plasma therapy is another option for treatment. Here antibodies in plasma from recovered patients are saved by plasmapheresis or affinity column- chromatography and properly sterilized and pathogen inactivated for use as substitution therapy in critically ill COVID 19 patients. The phytochemicals which induce immune system are good at its control especially as prophylactic measure, which can be objectively measured by assessment of natural antibodies, non-specific antimicrobial proteins, interferons, cytokines and cellular elements (i.e. natural killer cells), which are the most common tools to assess the immune modulation<sup>8</sup>. The effect of all the 3 approaches of treatment (not only medicine), described in *Ayurveda*, can be studied as intervention. This guideline has covered those symptoms and a list of medicines, which are recommended in Ayurvedic texts. So, at one hand this document would help our Ayurvedic physicians for recommending ayurvedic drugs for specific step of disease progress (*Samprapti*) and on the other hand, it will also help the basic scientists to explore the phytochemicals, present in these plants. This exploratory research would become stronger, once we collect the clinical data based on treatment with this protocol, which is one of the objectives of this document.

### **Symptomatology of COVID 19 infection as per WHO**

COVID-19 affects different people in different ways. Most infected people will develop mild to moderate illness and recover without hospitalization<sup>9</sup>.

Early symptoms include fever, dry cough, and tiredness. The late symptoms include aches and pains, sore throat, diarrhea, conjunctivitis, headache, and loss of taste or smell. Skin rash or discoloration of fingers or toes is other symptoms of the disease. Serious symptoms includes, difficulty breathing or shortness of breath, pain in chest, loss of speech or movement. The complications include severe pneumonia, septic shock, acute respiratory distress syndrome (ARDS) and multiorgan failure resulting in death<sup>10</sup>.

### **An Ayurvedic view on COVID-19**

*Acharya Sushruta*<sup>11</sup> has narrated that diseases do not develop without the involvement of *doshas* (bio-

humours). Hence, an intelligent physician should treat the unmentioned diseases as per the symptoms produced by *doshas*. As per *Charaka samhita*<sup>12,13</sup>, there are several diseases which are not described in the texts with names and such diseases are to be treated after examining the *doshas* and other factors involved in their manifestation. As per Ayurvedic classics, the present Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) may be considered as an *Aupasargika Roga* (communicable disease) which is pandemic in nature. The involvement of virus is the primary event in terms of *Upasarga* (infection) and this *Aupsargika Sankramaka Roga* (communicable infectious disease) which affects the susceptible host in whom *Vyadhikshamatva* (immune strength) is already compromised followed by involvement of other bio-factors<sup>14</sup>. *Acharya Dalhana*<sup>15</sup> has clearly stated the involvement of *kapha* in *sankramaka roga* that spreads especially through nasal cavity causing dry cough, nasal congestion, loss of smell, fever, tiredness etc. This may also resemble the *Janapododwamsa janya vikara* as described in texts of *Ayurveda*<sup>16</sup>. So, without making a debate on to the nomenclature of the disease, the management of *Agantuja vikara* (exogenous disorder) should be done on the lines of *nijavikara* (endogenous disorder)<sup>17</sup>, with the assessment of the dosha (bio-humours), *dushya* (which gets vitiated), *adhishthana* (seat) and *avastha* (stage) involved, and accordingly the management of the COVID-19 may be done.

The “*Ashtanga Ayurveda*”, describes its 8 branches to diagnose and treat the sufferings. These are the specialities, and being developed on clinical and experimental scientific tools. These includes *Kayachikitsa*, *Balachikitsa* (*Kaumarbhritya*), *Grahachikitsa* (*Bhootavidya*), *Shalakya Tantra*, *Shalya Tantra*, *Vishachikitsa* (*Agadatantra*), *Rasayana and Vajikarana*<sup>18</sup>. Regarding the types of diseases, it is broadly divided into: (1) *Nija* (endogenous) or (2) *Agantuja* (exogenous)<sup>19</sup>. In the 1<sup>st</sup> case, pathogenesis starts within the body and then manifests as a disease and in the 2<sup>nd</sup> case, the manifestation of the disease is at 1<sup>st</sup> stage and then followed by disturbances in all the seven *dhatus*, leading to various complications. This whole process of pathogenesis is defined as *samprapti* (etiopathogenesis), which is divided in to 6 stages called *shatkriyakala*<sup>20</sup>. Thus, for deciding the treatment, it is important to know the stage of disease. However, in *Ayurveda*, the treatment-prescription is personalized, because it varies from person to person,

based on his genetic constitution (*Prakriti*), *kala*, *bala* and other environmental factors<sup>21</sup>. This is now being defined as personal/customized medicine, in conventional system of health care. Regarding the aim of *Ayurveda*, it is defined to maintain the wellness of a healthy person and to treat a patient, inflicted with a disease. “स्वस्थस्यस्वास्थ्यरक्षणंआतुरस्यविकारप्रशमनं” (चरकसंहिता, सूत्रस्थान 30/26).

Further, regarding treatment, the holistic approach of *Ayurveda* has four components for patient care, which includes (1) Patient, (2) Attendant (Family members are paramedical staff), (3) Physician and the (4) Drug/Procedures<sup>22</sup>. When we talk of drug, then it includes (1) Animal products, (2) Herbal products and (3) Mineral products<sup>23</sup> which may be of 5 types of primary *Kalpana* (pharmaceutics/ dosage forms)<sup>24</sup> and their derived formulations. In *Ayurveda*, treatment through non-pharmacological approaches, have been given at most important, as it considers *Ahar* (diet), *Nidra* (sleep) and *Brahmacharya* (Code of conduct related to mental and physical activities) as the 3 pillars for good health, which need to be followed in day to day life<sup>25</sup>. These factors are enough to maintain the *Ayu*, which consists of (1) *Sharira*, (2) *Indriya*, (3) *Mana* and (4) *Atma*<sup>26</sup>, which ultimately maintains the mental, physical and spiritual health. However, for eliminating the disease, the cause of disease and accumulated toxins in the body, must be removed at 1<sup>st</sup> stage and for that procedures related to body purification, covering *langhan* and *panchakarma* therapy have been described. However, when a person gets a disease, due to three broad causes i.e., (1) *Asatmendriyarthasamyoga*-असात्मेन्द्रियार्थसंयोग (improper use of sense-organs), (2) *Pragyaparadha*-प्रज्ञापराध (knowingly doing wrong deeds) and (3) *Parinama*-परिणाम (time, place and season)<sup>27</sup>, then holistic line of treatment is recommended, which also consists of 3 types. These are: (1) *Daivavyapasharya* (दैवव्यपाश्रय)२ (*Yuktivyapashraya* (युक्तिव्यपाश्रय),)३ (*Satvavajaya* (सत्वावजय)<sup>28</sup>. The दैवव्यपाश्रय has been defined as spiritual therapy means “treatment by using mantra, talisman, wearing of gems, auspicious offerings, gifts, oblations, atonement, fasting, going to pilgrimage etc.”<sup>29</sup>. In traditional concept, the holistic approach to healing includes the body, mind and spirit, which involves both, community and environment, along with herbal remedies and ceremonies. Although Western cultures have accepted some traditional methods of relaxation and exercise, such as yoga and tai chi<sup>30</sup>, but many more interventions from *Ayurveda* can be included for scientific validation. Interestingly,

in recent years enough data have been published related to mindfulness, meditation, and related constructs, altering expectations, remoralization and instilling hope. Other intervention tools may include inducing the states of cognitive and emotional flexibility through specific symbolic interventions we term "flexibility primers" that can include images, metaphors, music and other media<sup>31</sup>. Other intervention includes spirit-body healing, a hermeneutic phenomenological research study. The Max Van Manen's method of researching the lived experience includes (1) go into darkness, (2) go elsewhere, (3) art becomes the turning point, (4) slip through the veil, (5) know the truth and trust the process, (6) embody your spirit, (7) feel the healing energy of love and compassion, and (8) experience transcendence<sup>32</sup>. A study from Bangladesh has reported that traditional healers use both religious and non-religious healing practices. The key religious healing practices reportedly included Kalami, Bhandai, and Spiritual Healing, whereas the non-religious healing practices included Sorcery, Kabiraji, and Home Medicine<sup>33</sup>. However, the interpretation and objective parameters to measure the degree of mindfulness, type of questions regarding what can and cannot be inferred from self-report measures and considerations regarding the structure of study design and data analyses are still to be answered. Many studies have used clinical hypnosis along with psychological and spiritual aspects to have better results, especially when, death is preceded by an incurable disease. It is important to note that *devavyapasharya* can also be considered under palliative care (the word came from a Latin word "pallium-mantle"), which offers a mantle of compassion and acceptance of what cannot be avoided<sup>34</sup>.

Though the researches are going on<sup>35</sup> a meta-analysis using 12-step-oriented interventions has been compared with active and inactive controls for spiritual/religious (S/R) interventions, and have concluded some positive response but they were statistically insignificant. The authors suggested having studies on more than 12-step-oriented S/R interventions<sup>36</sup>. This training is being given more to the nursing staff than the doctors in modern medicine, but in *Ayurveda*, it is the part of training of a qualified Ayurvedic doctor. Now similar therapeutic approach is being applied to the patients in the name of "spiritual healing"<sup>37</sup>, especially in cancer patients<sup>38</sup>. It has shown significant changes in blood hormones in a

double blind clinical trial (Effects of Spiritist "passe" (Spiritual healing) on stress hormone, pain, physiological parameters and length of stay in preterm newborns: a randomized, double-blind controlled trial<sup>39</sup>.

If all of them are applied simultaneously then there could be wonders in field of health care. This is the USP (Unique Selling Point) of *Ayurveda* and unfortunately, neither it is being taught nor being propagated in clinical practices. Most of the physicians depend on *Yuktivyapashraya* only, which is similar to allopathic system of medicine means only medicine.

#### **Nidana (Cause) of COVID 19 infection**

As of today, infection with the new coronavirus (severe acute respiratory syndrome coronavirus 2, or SARS-CoV-2) causes coronavirus disease 2019 (COVID-19). The virus appears to spread easily from person to person among those in close contact (within about 6 feet, or 2 m), *Bhoota* (afflictions by invisible objects)<sup>40</sup>, *Krimi* (microorganisms), close contact with the infected persons, consumption of denatured plants, polluted air and infected animals, respiratory droplets released when the infected person coughs, sneezes or talks, touches a surface with the virus on it and then touches his or her mouth, nose or eyes<sup>41</sup>. As per *Ayurveda*, this type of infection occurs due to *Pragyaparadha* (intellectual blasphemy; knowingly opting the wrong things may be dietetic or behavioural<sup>18,42</sup> *Asuchi*<sup>43</sup> (uncleanliness). In fact, the *Pragyaparadha* is linked to fear, which directly affects the immune system, which is considered under psychoneuroimmunology<sup>44</sup>. The fear can be defined by many terms, but in NAMASTE portal of AYUSH some related terms have been given which can be covered in this heading and also in "*Bhoot Vidya*:", defined above. These terms are देवबलप्रवृत्त रोगः (diseases caused by supernatural agencies); विद्युदशनिकृत-रोगः (diseases caused by lightning and thunder) and पिशाचादिकृत-रोगः (diseases caused by evil spirits)<sup>18</sup>. The term *Asuchi* refers to hygiene, which is again related to immunity and also more chances of microbial infection, spread in community<sup>45</sup>. This can be now correlated with physical distancing and other recommendations of WHO regarding COVID-19.

#### **Ayurvedic view of Samprapti (Pathogenesis) of COVID 19 infection**

As per *Ayurveda* the pathological probability of severe acute respiratory syndrome coronavirus

2 infection may be due to accumulation and aggravation of *Kapha Vata* (some opine –Vata Kapha) followed by involvement of *Pitta* within the *Pranavahasrotasa* (channels carrying *prana*/ channels of respiration/respiratory system). Later on, other *srotas* viz. *Rasavaha* (channels carrying nutrient fluids), *Raktavaha* (channels carrying blood tissue), *Annavahasrotas* (digestive tract), *Purishavahasrotas* (channels in which faeces is formed and excreted) etc. also get affected. In this infection, *dushya* are initially *rasa* and *rakta* (components of blood) followed by the involvement of all other *dhatu*s in the advanced condition. Due to *mandaagni* (hypo functioning of bio-fire), there is a derangement in digestion and metabolic activities. In *Ayurveda*, this term is widely used in pathogenesis of all diseases. There are 13 types of *Agnies*. The master agni is “*Jathraagani*”, which is related to GIT tract function, means digestion and absorption. The remaining 12 *agnies* are five-*bhutaagnies* and 7 *dhatwaagnies*, working at tissue and cellular level. In modern science, these terms can be correlated with metabolic enzymes in cells and its abnormal activity results to accumulation of modified proteins, which needs to be removed by lysosomal proteases. This leads to development and accumulation of *Ama*. The term “*Ama*” has been defined in *Ayurveda* as “undigested and improperly processed food and metabolites”. This accumulation at cell and tissue levels further blocks the channels and receptors which have been defined in *Ayurveda* as “*Srotovarodha*”. In case of COVID-19, it is mainly the obstruction in the *pranavahasrotas* which is related to respiratory system. This obstruction induces abnormality in the *Kapha-Vatadosha* to a greater extent, which may be defined as biochemical changes in all tissues, involved in making respiratory organs; which finally affects the normal physiology of respiration.

In the asymptomatic state (initial 1–2 days of infection), that is, the *sanchaya* stage (stage of accumulation), the inhaled virus SARS-CoV-2 enters into the body. In the *prakopa* stage, (stage of aggravation) it binds to epithelial cells in the nasal and buccal cavity producing symptoms like sneezing, rhinorrhoea, mild coughing. In this stage, replication starts and local propagation of the virus can be detected by nasal swabs. In the *Prasara* stage (stage of spread), the virus multiplication is further enhanced with spread causing the development of symptoms like fever, myalgia, malaise etc. In the next few days,

the virus propagates and migrates down the respiratory tract along the communicating airways and localizes there (*sthanasamshraya*- stage of premonitory symptom). A complete or partial loss of the sense of smell (anosmia) has been reported in few cases of COVID-19 in this stage. Once the infection localizes in the *Pranavahasrotas* (respiratory tract), development of *vyaktavastha* (stage of manifestation) of the disease takes place with the manifestation of symptoms like Fever, Cough, Myalgia, Fatigue, Headache, Sputum production, Diarrhea, Malaise, Shortness of breath/dyspnoea and Respiratory distress etc. In this stage it will affect the other systems and large number of viral particles is released causing viremia affecting gastro intestinal & urinary system as well. If proper care and therapeutics are not administered in the *vyaktavastha*, it leads to the progression of next stage of the disease i.e., *bhedavastha* (stage of complication) and produces complications like severe pneumonia, septic shock, acute respiratory distress syndrome (ARDS), and multiorgan failure, resulting in death. The process of disease progress (*samprapti*/etiopathogenesis) is given in Figure 1. Its salient features are described below on the basis of the concept of “*Shatkriyakala*”, (stages of disease manifestation and its management)<sup>18</sup> which has been defined as 6 stages of disease pathogenesis. As of now, no objective parameter has been correlated with these stages of pathogenesis but in traditional knowledge has been properly defined. These are correlated to *Nadi-parikshan* (Pulse analysis), which is also not well studied. Now, the efforts are being made on the basis of observational studies, as an instrument (*Nadi-Tarangani*, based on the IPR of IIT, Bombay) has been developed, based on data of artificial intelligence. Thus, here, these terminologies of traditional knowledge can be considered as hypothesis, but it will act as the basis for formulating future research projects.

- 1. Stage I**-First three stages of *Shatkriyakala*, viz., *Sanchaya*, *Prakopa* & *Prasara*, mentioned above represents the incubation period of virus i.e. generally 2 -14 days, depending on the immune status of the host with predominance of *Kapha* & *Vatadosha* including *Pitta*.
- 2. Stage II**-It is the *Sthanasamshraya* stage of *Shatkriyakala*, in this stage there is an amalgamation of *doshadushya* in the *pranavahasrotas* leading to development of prodromal symptoms.

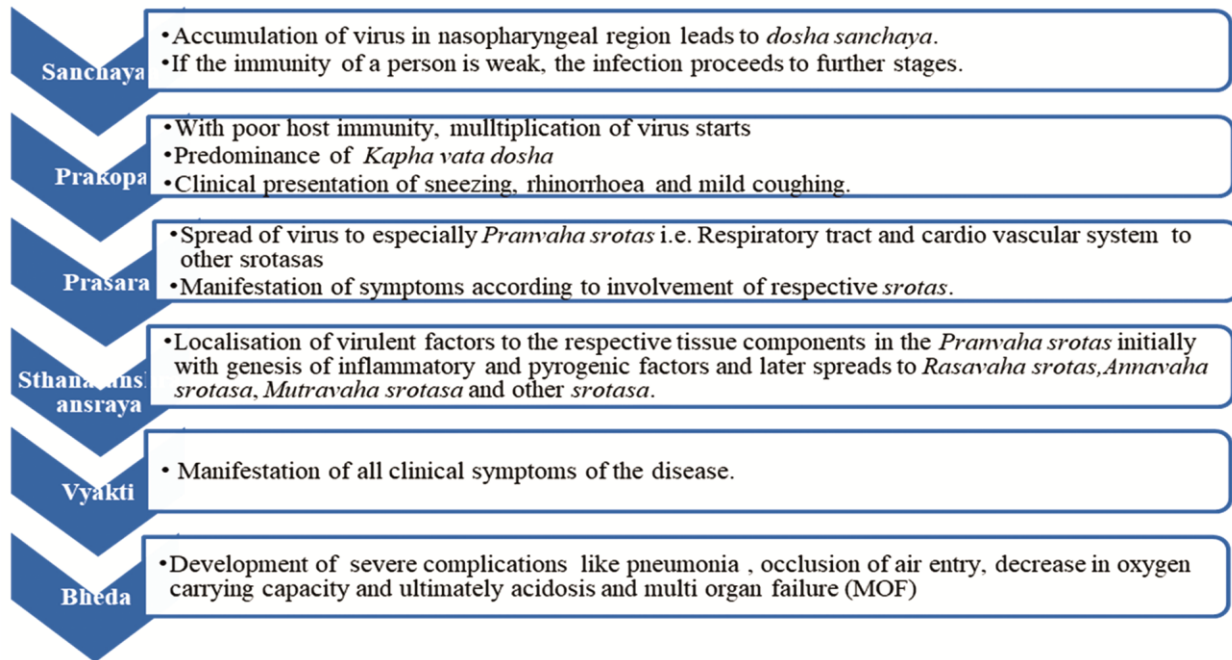


Fig. 1 — The *Samprapti* (Etiopathogenesis of disease progress as per *shatkriyakal* concept of *Sushrut Samhita*)

3. **Stage III**-This is the *Vyaktavastha* stage of *Shatkriyakala*, and here stable clinical features associated with Tridosha are visualized. Depending on the immune status there will be an appearance of the complete symptoms or partial symptomatology.
4. **Stage IV**-*Bhedavastha* stage of *Shatkriyakala*, at this stage, *dhatupaka* and specific complications are visualized along with above constitutional symptoms based on *Tridosha* dominance as in case of
- **Kapha predominant Sannipata:** Acute Respiratory Distress Syndrome/Respiratory failure.
  - **Vata predominant Sannipata:** Cardiac arrest, Cardiomyopathy, Myocardial infarction.
  - **Pitta predominant Sannipata:** Alteration of Hepatic & Renal functions & finally leads to Hepato-renal syndrome and vascular coagulopathy. In fact it is situation “progressing towards Multi-organ failure” which has been defined as “Sannipath” in Ayurveda.
  - **Sannipata:** Multi-organ failure (MOF) and finally death.
- Sampraptighataka (Component of pathogenesis)**
- **Nidana-** *Aupasargika/Sankramaka/Agantujanidan*
  - **Dosha-** Predominance of *Kapha-Vata* associated with *Pitta*.
  - **Dushya-** Primary – *Rasa, Rakta* & secondary involvement of other *dhatu*s, *malas* and *Ojas*.
- **Srotas** –*Pranava*, *Rasava*, *Raktava*, *Annava*, *Purishava*.
  - **SrotodustiLakshana-** *Atipravritti, Sangha* and *Vimargagamana*
  - **Udhhavasthana-***Nasa, Kantha, Uras*.
  - **Vyaktasthana** –*Nasa, Kantha, Uras, Sarvasharira*.
  - **Agni-Jatharagnimandya** + *dhatvagnivaishmya*
  - **Swabhava-Daruna** and *Ashukari*
  - **Prabhava-Sadhya, Kricchrasadhya** or *Asadhya* depending upon *Aturabala* and *Vyadhibala*.
- Patient with comorbid factors associated with complications and immunosuppression should be omitted.
- Treatment**
- Regarding the treatment of COVID19 suspected people and corona positive patients a different protocol has been recommended. In addition to that, the prophylactic measures for general public and those who have been discharged from the hospital another set of diet, life style and food supplements have been recommended. The detailed treatment protocol is beyond the scope of this article (Segmentation of the target population as suggested in detailed guidelines has been described in Table 1) however, the prophylactic measures based on all the 3 approaches of treatment i.e., *Daiva Vyapashraya, Yukti Vyapashraya* and *Sattvavajaya* have been described below.



Table 1 — Target groups and their management principle

SN	Target groups	Treatment
1.	Target Group 1(A): Quarantine-Home/ general population	General Preventive measures
2.	Target Group 1(B): Quarantine Centre	General Preventive measures
3.	Target Group 1(C): Health workers, Sanitation workers, Police cops, Media person	Extensive preventive measures (along with psychological counseling where ever required)
4.	Target Group 2(A): Asymptomatic COVID19 +ve cases	<i>Ojovardhak Dravya</i> (Immunity boosters) + <i>Vishaghna</i> (Anti-toxic) <i>dravya</i> specific to viral infection.+ <i>Krimigna</i> Drugs (Antimicrobials)
5.	Target Group 2(B): COVID19 +ve Subjects with Mild symptoms	Curative and Symptomatic treatment
6.	Target Group 2(c): COVID19 +ve Subjects with Moderate symptoms	Curative and Symptomatic treatment
7.	Target Group 2(D): COVID19 +ve patients with co-morbidity/Patients above 60 years of age.	Condition specific + Curative and Symptomatic treatment
8.	Target Group 2(E): Pregnant women and Children	Separate treatment protocol
9.	Target Group 3: Post treatment restorative	Treatment for recovery and Rejuvenation, prevent recurrence including <i>Samshodhana chikitsa</i> *

\**Samshodhana chikitsa* should always be undergone under the supervision of qualified *Panchkarma* specialist after taking prior consent from the patient

The Target Group 1, who is under quarantine and also for general population, who have no disease symptom but may have some kind of anxiety & stress due to this lockdown or pandemic situation, around the world, may follow the given protocol.

#### Management of Anxiety and stress through *Sattvavajaya* and *Daiva Vyapashraya Chikitsa*

- Counseling
- Education about disease and its management.
- To follow daily routine as per guidelines of *Ayurveda*.
- ✓ Good sanitary and sleep practices with daily follow up sleep schedule of the same bedtime and wake up time.
- ✓ Diet should be healthy and balanced contain a variety of different foods and drinks having wide range of nutrients and at right time
- ✓ Exercise as per *sharirabala* and season

*Yama* (Yama-ethical rules/ moral imperatives), *Niyama* (virtuous habits, behaviours and observances), *Pranayama* (control of breath observances), *Dhyana* (meditation) with *Japa - Mantra* chanting (incantation) (according to one's own religion and belief)<sup>18</sup>

#### General measures/*Atura Balavridhhi* (Immunity Boosting) through *Ojovardhaka* and *Rasayana* (Immunity boosters)

Daily intake of *Go-dugdha* (cow milk), *Go-ghrita* (cow ghee) or medicated *Ghrita*. *Go Dugdha* and *Go-ghrita* are included in *Aajasrikarasayan*,

presumed to improve immunity. In fact milk intake has been considered as high protein diet in medical science<sup>46</sup>. In Ayurveda, milk of different animals have been described for different therapeutic potentials, but cow Milk as been defined as *Balya* and *Jivaniya*<sup>47</sup>. The Human milk provides a very wide range of nutrients and bioactive components, including immune factors, human milk oligosaccharides, and a commensal microbiota<sup>48</sup>. These factors are essential for interconnected processes including immunity programming and the development of a normal infant gastrointestinal microbiome, especially in infants<sup>49</sup>. A recent paper indirectly links high presence of Nicotinamide residue in Cow milk, which is related to be important factor in immuno-boosting<sup>50,51</sup> intake of medicated drinking water - *Shadangapaniya*<sup>52</sup>. It is the boiled water, supplemented with decoction of several herbs, which have shown to be immuno-booster and antioxidant in several studies. Thus, taking such medicinal plants on daily basis has been linked to good health and also for enhancement of appetite. Kwatha made with herbs like *Yavani* (*Trachyspermum ammi* Linn.)<sup>53</sup>, *Lavanga* (*Syzygium aromaticum* Linn.)<sup>54</sup>, *Pippali* (*Piper longum* Linn.)<sup>55</sup> and *Tulasi* (*Ocimum sanctum* Linn.)<sup>56</sup> etc. that possess anti-viral activity or administration of boiled luke warm water may be used.

- Daily intake of *Kwatha* (Water decoction)/*Phanta* of medicinal plants like *Sunthi* (*Zingiber officinale* Roxb.), *Dalchini* (*Cinnamomum zeylanicum*

Breyn), *Maricha* (*Piper nigrum* Linn.), *Yavani* (*Trachyspermum ammi* Linn.), *Guduchi* (*Tinospora cordifolia* Willd Miers ex Hook f. & Thoms), *Parijata* (*Nyctanthes arbortristis* Linn.), *Papita* (*Carica papaya* Linn.), *Tulasi* (*Ocimum sanctum* Linn.), *Trikatu*. These herbs have proven report of antipyretic, anti-inflammatory and antioxidant potentials, already published in several experimental models<sup>57-59</sup>. Since these changes are reported in COVID-19 pathogenesis, so it could be suggested to combat the symptoms of this disease.

- **Use of single drug**

*Guduchi* (*Tinospora cordifolia* Willd Miers ex Hook f. & Thoms)<sup>60</sup>, *Tulasi* (*Ocimum sanctum* Linn.)<sup>61</sup>, *Haridra* (*Curcuma longa* Linn.)<sup>62</sup>, *Manjistha* (*Rubia cordifolia* Linn.)<sup>63</sup>, *Amalaki* (*Emblia officinalis* Gaertn.)<sup>64</sup>, *Ashwagandha* (*Withania somnifera* Linn.)<sup>65</sup>, *Yashtimadhu* (*Glycyrrhiza glabra* Linn.)<sup>66</sup>, *Draksha* (*Vitis vinifera* Linn.)<sup>67</sup>, *Kharjura* (*Phoenix sylvestris* Roxb.) etc. possess immunomodulator activity and thus enhances immunity.

- **Use of formulation**

Rasayana formulations are the classical formulations, described in ayurvedic texts. They are claimed to have rejuvenation, health promotive and memory enhancer potentials as supported by classical references. They have medicinal plants as their components and all the plants have been studied separately for their therapeutic potentials like antiviral, anti inflammatory, antioxidant and immunomodulation. *Guduchighanvati* or *Sanshamanivati*<sup>68</sup>, *Chyavanprasha*<sup>69</sup>, *Brahma rasayana*<sup>70</sup>, *Amalakichurna*<sup>71</sup> etc are some of such formulations. Their regular use as functional food has been reported to be health promotive by regulating several biochemical pathways, which is beyond the scope of this article.

#### Other measures

##### ***Dhoopana Karma* (Fumigation)**

*Dhoopana karma* is a well-known procedure for disinfection. In the *vishakta vayu chikitsa*, *Acharya Sushruta* mentions the use of *dhoopa* to relieve the toxic effects of *visha yukta vayu*<sup>72</sup>. Most of the *dhoopandravyas* have essential oils which are volatile in nature. Their volatility becomes advantage in lowering microbial contamination in air and on difficult to reach surfaces. It creates an aseptic environment, kills microbes and thus, prevents

opportunistic infection. Side by side if volatile substances are inhaled it interfere the multiplication of micro-organism in lung and thus reduces the microbial load<sup>73,74</sup>. In addition to this, *dhoopana* also help in inhaling the fumes of these medicinal plants, which is considered under "*Nasya*" *chikitsa*. The olfactory receptors in nose get activated and regulate several metabolic pathways. Various phytochemicals like luteolin have shown antioxidant, anti-inflammatory, antimicrobial, and neuroprotective activities through inhalation of their vapor or smoke. Various odorants have been developed. These molecules bind to the odorant receptors and induce signaling pathways in the olfactory sensory neurons, and transmit electrical signals to the brain, finally controlling the neuroendocrine system<sup>75</sup>. This process can be compared to the topical steroidal anti-inflammatory drugs, such as glucocorticoids etc. which are routinely prescribed for treating upper airway inflammatory conditions, such as chronic rhinosinusitis<sup>76</sup>. It is already reported that nasal route of infection can cause encephalitis in humans and since olfactory route has been now accepted as an important pathway for viral entry into the CNS, then the same pathway could also be used for drug administration for effective treatment. This theory was hypothesized in 1935, that olfactory route is the portal for virus entry into the central nervous system (CNS). More recently, studies of antiviral innate and adaptive immune responses within the olfactory bulb suggest it provides early virologic control<sup>77</sup>. Drugs like *Laksha* (*Laccifer lacca* Kerr.), *Haridra* (*Curcuma longa* Linn.), *Ativisha* (*Aconitum heterophyllum* Wall.), *Haritaki* (*Terminalia chebula* Retz.), *Badi-ela* (*Amomum subulatum* Roxb.), *Ela* (*Elettaria cardimomum* Maton.), *Tagara* (*Velerina wallichii* DC.), *Kushtha* (*Saussurea appa* C.B. Clarke), *Priyangu* (*Callicarpa macrophylla* Vahl.), *Lobana* (*Styrax benzoin* Dryand.), *Rakshoghna dhupana*, or with *Guggulu* (*Commiphora mukul* Hook ex Stocks), *Raal* (*Shorea robusta* Gaertn.), *Kapura* (*Cinnamomum camphora* Nees. & Eberm), *Jatamansi* (*Nardostachys jatamansi* DC.), *Yavani* (*Trachyspermum ammi* Linn.) etc may be used for *dhoopana*, based on their easy availability and cost.

##### **Disinfectants**

In the *vishakta bhoomi chikitsa*, *acharya sushruta* explains the method of spraying/ sprinkling *vishaghna* and *krimighna dravyas* over the *bhoomi* or other surfaces which contain the toxic material<sup>78</sup>.



*Vishaghna dravyas* having capacity to neutralize the poisonous effect including toxins of bacteria and virus<sup>79,80</sup>.

Use of disinfectants prepared out of *Vishagna dravyas* like *Haridra* (*Curcuma longa* Linn.), *Nimba* (*Azadirachta indica* A. juss), *Madayantika* (*Lawsonia inermis* Linn.), *Shirisha* (*Albizia lebbeck* Benth), *Punarnava* (*Boerhavia diffusa* Linn.) etc.

#### Sanitizers

Contact of *visha yukta vastra, shayya, abhushana* etc, *Acharya sushruta* explains the use of *lepa* of *vishaghna dravyas* as a remedy<sup>81</sup>. Sanitizers are the substance or fluid designed to kill germs on skin and objects. Hands are the most common mode of transmission of pathogens. Hence use of above drugs as hand sanitizer can prevent health care-associated infections<sup>82</sup>.

Use of hand sanitizers prepared out of *Vishagna dravyas* like *Ghratakumari* (*Aloe vera* Tourn. Ex Linn), *Haridra* (*Curcuma longa* Linn.), *Nimba* (*Azadirachta indica* A. juss), *Madayantika* (*Lawsonia inermis* Linn.), *Koshataki* (*Luffa acutangula* (Linn.) Roxb.), *Shirisha* (*Albizia lebbeck* Benth), *Punarnava* (*Boerhavia diffusa* Linn.) etc. or available drugs.

#### Kavala/Gandusha

*Gandusha* is liquid or oil pulling/ holding of any liquid in mouth). Holding of medicated liquid of these herbal drugs in mouth can reduced the viral load and irritation in oropharyngeal region and imparts soothing effect in that area and strengthens gum and teeth. Especially as virus remains in throat or oral cavity for long time and multiplies here. So this procedure, especially with *Vishaghna* and *Krimighna dravyas* will help. With *kwatha* of *Haridra* (*Curcuma longa* Linn.), *Vidanga* (*Embelia ribes* Burm. F.), *Patha* (*Cissampelos pareira* Linn.), *Manjishta* (*Rubia cordifolia* Linn.), *Ela* (*Elettaria cardimomum* Maton.), *Brihati* (*Solanum indicum* Linn.), *Indravaruni* (*Cocculus hirsutus* Linn. Diels), *Tagara* (*Velerina wallichii* DC.), *Kushta* (*Saussurea appa* C.B. Clarke), *Triphala*, *Vasa* (*Adhatoda vasica* Nees.), *Kantkari* (*Solanum surratense* Burm. F.) and *Shirisha* (*Albizia lebbeck* Benth) etc. as per availability of drugs. *Yavakshara* and *lavana* mixed with oil or simple saline gargle.

#### Nasya Karma (errhine therapy) (Pratimarsha Nasya)

Due to lipid in nature, *nasya karma* may interfere to the cell membrane of virus and it checks the multiplication of virus at nasal site and thus reduces

viral load and severity of infection. May be given with *Anutaila*, *Narikelataila*, *Sarshapataila*, *Goghrita*, *Shadabindutaila*, etc. as per the requirement.

#### Post disease treatment

In case of those people who have been discharged from the hospital after treatment having Corona test negative but have fear of recurrence, should be primarily treated for their Psychological counseling and rejuvenation therapy by *Medhya rasayana* and *Balya Rasayana* to strengthen their physical components and maintain the normal physiology. *Medhya rasayana* drugs are advocated to the patients to nullify variety of mental stressors including disease Covid-19 itself and strengthen mental stamina while *balya rasayana* imparts physical strength and empower physiological fulfillment. The following treatment related to *Ojovardhaka/Rasayana* (Immunity boosters) formulations like *Rasasindura*<sup>83</sup>, *Swarnabhasma*<sup>84</sup>, *Makardhwaja*<sup>85</sup>, *Dooshivishari gutik*<sup>86</sup>, *Guduchighanvati* or *Sanshamanivati*, *Chyavanaprashavleha*, *Samshodhanachikitsa* etc. along with nutritive diet, good sleep, physical exercise, procedures of *Astang yoga* may be included in the daily life practices. Utmost care should be taken while prescribing herbomineral preparations, like *Rasasindura*, *Swarnabhasma Makardhwaja* etc. to ensure their quality and safety aspect<sup>87,88</sup>. Only such products should be prescribed, manufactured abiding the standards, protocols and standard operative procedures (SOPs) mentioned in the official text book including pharmacopoeia. Drug dosing, *anupana* (vehicle) and other factors including individual humours (*Dosha*), individual constitution (*Prakriti*), time (*Kaala*), age (*Vaya*), digestive capacity (*Agni*) etc.<sup>89</sup>, should also be considered. The regular guidance from an Ayurvedic physician is always recommended.

#### Acknowledgement

The authors are thankful to all other teachers of faculty of Ayurveda, who have given their suggestions from time to time through personal discussions. This work has not been funded by any source. The authors are thankful to BHU administration for allowing us to organizing an International webinar with the help of Prof Bejon Misra, the consultant to Institute of Medical Sciences, Banaras Hindu University, Varanasi. The outcome of this seminar was documented as Nine point



- 38 Puchalski C M, King S D W & Ferrell B R, Spiritual Considerations, *Hematol Oncol Clin North Am*, 32 (3) (2018)505-517.
- 39 Carneiro É M, Barbosa L P, Bittencourt A C, *et al.*, Effects of Spiritist "passe" (Spiritual healing) on stress hormone, pain, physiological parameters and length of stay in preterm newborns: a randomized, double-blind controlled trial, *J Complement Integr Med*, 15 (4) (2018) 0015.
- 40 Anonymous, *Charaka Samhita, Chikitsa Stanam*, 3<sup>rd</sup> Chapter, 114<sup>th</sup>-116<sup>th</sup> Sloka, 1998.
- 41 Anonymous, *Sushrut Samhita, Nidana Stanam*, 5<sup>th</sup>Chapter, 33<sup>rd</sup>-34<sup>th</sup>Sloka, 1988.
- 42 Anonymous, *Charaka Samhita, Nidana Stanam*, 7<sup>th</sup>Chapter, 21<sup>st</sup> Sloka, 1992.
- 43 Anonymous, *Sushrut Samhita, Nibandhasamgraha* commentary, *Uttar tantra*, 60<sup>th</sup>Chapter, 5<sup>th</sup>Sloka, 2009.
- 44 Macfarlane Burnet, The Newer Approach to Immunity in Its Bearing on Medicine and Biology, *Br Med J*, 2 (4881) (1954) 189-193.
- 45 Wallin J E W, The Hygiene of Eugenic Generation, *Psychol Clin*, 8 (6) (1914)170-179.
- 46 Cacho N T & Lawrence R M, Innate Immunity and Breast Milk, *Front Immunol*, 8 (2017)584.
- 47 Anonymous, *Charaka Samhita, Sustra Stanam*, 27<sup>th</sup> Chapter, 4<sup>th</sup> Sloka, 1992.
- 48 Ruiz L, Espinosa-Martos I, García-Carral C, *et al.*, What's Normal? Immune Profiling of Human Milk from Healthy Women Living in Different Geographical and Socioeconomic Settings, *Front Immunol*, 8 (2017)696.
- 49 Yoshii K, Hosomi K, Sawane K & Kunisawa J, Metabolism of Dietary and Microbial Vitamin B Family in the Regulation of Host Immunity, *Front Nutr*, 6 (2019) 48.
- 50 Rajman L, Chwalek K, Sinclair D A, Therapeutic potential of NAD-boosting molecules: The in vivo evidence, *Cell Metab*, 27 (3) (2018) 529-547.
- 51 Trammell S A, Yu L, Redpath P, Migaud M E & Brenner C, Nicotinamide riboside is a major NAD<sup>+</sup> precursor vitamin in cow milk, *J Nutr*, 146 (5) (2016) 957-963.
- 52 Anonymous, *Charaka Samhita, Chikitsa Stanam*, 3<sup>rd</sup> Chapter, 145<sup>th</sup> Sloka, 1998.
- 53 Roy S, Chaurvedi P & Chowdhary A, Evaluation of antiviral activity of essential oil of *Trachyspermum Ammi* against Japanese encephalitis virus, *Pharmacognosy Res*, 7 (3) (2015) 263-267.
- 54 Cortés-Rojas D F, de Souza C R & Oliveira WP, Clove (*Syzygium aromaticum*): a precious spice, *Asian Pac J Trop Biomed*, 4 (2) (2014) 90-96.
- 55 Yao L, Chen H P, Ma Q, Piperlongumine alleviates lupus nephritis in MRL-Fas(lpr) mice by regulating the frequency of Th17 and regulatory T cells, *Immunol Lett*, 161 (1) (2014) 76-80.
- 56 Cohen M M, Tulsi - *Ocimum sanctum*: A herb for all reasons, *J Ayurveda Integr Med*, 5 (4) (2014) 251-259.
- 57 Chang J S, Wang K C, Yeh C F, *et al.*, Fresh ginger (*Zingiber officinale*) has anti-viral activity against human respiratory syncytial virus in human respiratory tract cell lines, *J Ethnopharmacol*, 145 (1) (2013) 146-151.
- 58 Pandey A K, Kumar P, Singh P, *et al.*, Essential oils: Sources of antimicrobials and food preservatives, *Front Microbiol*, 7 (2017) 2161.
- 59 Gupta P, Bajpai S K, Chandra K, *et al.*, Antiviral profile of *Nyctanthes arbortristis* L. against encephalitis causing viruses, *Indian J Exp Biol*, 43 (12) (2005) 1156-1160.
- 60 Sharma U, Bala M, Kumar N, Singh B, Munshi R K, Bhalerao S, Immunomodulatory active compounds from *Tinospora cordifolia*, *J Ethnopharmacol*, 141 (3) (2012) 918-926.
- 61 Ghoke S S, Sood R, Kumar N, *et al.*, Evaluation of antiviral activity of *Ocimum sanctum* and *Acacia arabica* leaves extracts against H9N2 virus using embryonated chicken egg model, *BMC Complement Alternat Med*, 18 (1) (2018) 174.
- 62 Pan M H, Wu J C, Ho C T & Badmaev V, Effects of water extract of *Curcuma longa* (L.) roots on immunity and telomerase function, *J Complement Integr Med*, 14 (3) (2017).
- 63 Lodi S, Sharma V & Kansal L, The protective effect of *Rubia cordifolia* against lead nitrate-induced immune response impairment and kidney oxidative damage, *Indian J Pharmacol*, 43 (4) (2011) 441-444.
- 64 Lv J J, Yu S, Xin Y, *et al.*, Anti-viral and cytotoxic norbisabolane sesquiterpenoid glycosides from *Phyllanthus emblica* and their absolute configurations, *Phytochemistry*, 117 (2015) 123-134.
- 65 Birla H, Keswani C, Rai S N, *et al.*, Neuroprotective effects of *Withania somnifera* in BPA induced-cognitive dysfunction and oxidative stress in mice, *Behav Brain Funct*, 15 (1) (2019) 9.
- 66 Chu XT, de la Cruz J, Hwang S G & Hong H, Tumorigenic effects of endocrine-disrupting chemicals are alleviated by licorice (*Glycyrrhiza glabra*) root extract through suppression of AhR expression in mammalian cells, *Asian Pac J Cancer Prev*, 15 (12) (2014) 4809-4813.
- 67 González-Quilen C, Gil-Cardoso K, Ginés I, *et al.*, Grape-Seed Proanthocyanidins are Able to Reverse Intestinal Dysfunction and Metabolic Endotoxemia Induced by a Cafeteria Diet in Wistar Rats, *Nutrients* 11 (5) (2019) 979.
- 68 Anonymous, *Siddha Yoga Sangraha*, Chapter-1, Jwarrogadhikar, 1984.
- 69 Anonymous, *Charaka Samhita, Chikitsa Stanam*, 1<sup>st</sup> Chapter, 1<sup>st</sup> Part, 62<sup>nd</sup>-74<sup>th</sup> Sloka, 1998.
- 70 Anonymous, *Charaka Samhita, Chikitsa Stanam*, 1<sup>st</sup> Chapter, 1<sup>st</sup> Part, 41<sup>st</sup>-57<sup>th</sup> Sloka, 1998.
- 71 Anonymous, *Charaka Samhita, Chikitsa Stanam*, 1<sup>st</sup> Chapter, 2<sup>nd</sup> Part, 8<sup>th</sup> Sloka, 1998.
- 72 Anonymous, *Sushruta Samhita, Kalpa sthana*, Commentary *Nibandha Sangraha* 3<sup>rd</sup> Chapter, 17<sup>th</sup> Sloka, 2007.
- 73 Jadhav P, Kapoor N, Thomas B, *et al.*, Antiviral potential of selected Indian medicinal (Ayurvedic) plants against Herpes Simplex virus 1 and 2, *N Am J Med Sci*, 4 (12) 2012, 641-647.
- 74 Y.L. Nene, Fumigation of plants in Vrikshayurveda, *Asian Agri-History*, 18 (1) (2014) 23-41.
- 75 Yoon YC, Hwang JT, Sung MJ *et al.*, Inhibitory effect of luteolin on the odorant-induced cAMP level in HEK293 cells expressing the olfactory receptor, *Biofactors*, 38 (5) (2012) 360-364.
- 76 Chang S Y & Glezer I, The balance between efficient anti-inflammatory treatment and neuronal regeneration in the olfactory epithelium, *Neural Regen Res*, 13 (10) (2018) 1711-1714.

- 77 Durrant D M, Ghosh S & Klein R S, The Olfactory Bulb: An immunosensory effector organ during neurotropic viral infections, *ACS Chem Neurosci*, 7 (4) (2016) 464-469.
- 78 Anonymous, *Sushrut Samhita, Nibandhasamgraha* commentary, *Kalpa stanam*, 3<sup>rd</sup> Chapter, 12<sup>th</sup> Sloka, 2007.
- 79 Anantkumar V, Kanchan S & Borkar M, To Study the Efficacy of Ayurvedic Dhoopan for Operation Theater Sterilization, *International Journal of Advanced Ayurveda, Yoga, Unani, Siddha Homeopathy*, 2 (1) (2013) 143-147.
- 80 Bhatwalkar S B, Shukla P, Srivastava R K, *et al.*, Validation of environmental disinfection efficiency of traditional Ayurvedic fumigation practices, *J Ayurveda Integr Med*, 10 (3) (2019) 203-206.
- 81 Anonymous, *Sushrut Samhita, Nibandhasamgraha* commentary, *Kalpa stanam*, 1<sup>st</sup> Chapter, 53<sup>rd</sup> Sloka, 2007.
- 82 Wani N S, Bhalerao A K, Ranaware V P & Zanje R, Formulation and evaluation of herbal sanitizer, *Int J Pharm Tech Res*, 5 (1) (2013) 40-43.
- 83 Anonymous, *Rasa Tarangini*, 6<sup>th</sup> Chapter, 162<sup>nd</sup>-167<sup>th</sup> Sloka, 1971.
- 84 Anonymous, *Rasa Tarangini*, 15<sup>th</sup> Chapter, 69<sup>th</sup> Sloka, 1971.
- 85 Anonymous, *Bhaishajya Ratnavali, Vajikarana Prakaranam*, 114<sup>th</sup> -117<sup>th</sup> Sloka, 1997.
- 86 Anonymous, *Astanga Hridayam, Sarvangasundara* commentary, *Uttara Stanam*, 35<sup>th</sup> Chapter, 39<sup>th</sup> Sloka, 2000.
- 87 Kumar G, Srivastava A, Sharma S K, Gupta Y K, Safety evaluation of mercury based Ayurvedic formulation (Sidh Makardhwaj) on brain cerebrum, liver & kidney in rats, *Indian J Med Res*, 139 (4) (2014) 610-618.
- 88 Paul W, Sharma C P, Blood compatibility studies of Swarna bhasma (gold bhasma), an Ayurvedic drug, *Int J Ayurveda Res*, 2 (1) (2011) 14-22.
- 89 Anonymous, *Sharangadhar Samhita, Purvakhanda*, 1<sup>st</sup> Chapter, 37<sup>th</sup> Sloka, 2005.