

## Preparedness of Siddha system of medicine in practitioner perspective during a pandemic outbreak with special reference to COVID-19

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### ABSTRACT

COVID-19 (Corona Virus Disease-2019) is an infectious respiratory disease caused by the most recently discovered coronavirus, SARS-CoV-2 (Severe Acute Respiratory Syndrome Corona virus-2). This new viral disease was unknown before the outbreak began in Wuhan, China, in December 2019. As of November 16th 2020, it affects about 54.3 million populations, death toll increased to 1.32 million cases in worldwide. Whereas in India 8.85 cases are infected with COVID-19, of which 1, 30, 112 cases were died. Till now there has been no specific anti-virus drug or vaccines are available for the treatment of this disease, the supportive care and non-specific treatment to the symptoms of the patient are the only options in Biomedicine, the entire world turns its attention towards alternative medicine or Traditional medicine. Siddha medicine is one of the primordial systems of medicine practiced in the southern part of India, it dealt a lot about pandemic, and its management. This review provides an insight into Pandemic in Siddha system and its management in both ancient history and modern history, National and state level Government policies related to current pandemic, World Health Organization (WHO) guidelines on usage of unproven drug during infectious disease outbreak, Preparedness of Siddha system during a pandemic outbreak Challenges and Recommendations.

**Keywords** Herbal medicine, Alternative medicine, Traditional medicine, Quarantine, Isolation, Corona virus

### 1. INTRODUCTION

A pandemic is a disease outbreak that spreads across countries or continents, affects more people and takes more lives than an epidemic. The World Health Organization (WHO) affirmed COVID-19 to be a pandemic when the illness was become severe and spreading quickly over a wide area (Web MD, n.d.). Human population has suffered from many pandemics throughout history like smallpox, tuberculosis, HIV/AIDS, H1N1. It has created terrible damage in many different forms. The following table shows a list of pandemic events occurred Worldwide (Samal J, 2014) (Table 1).

**Table 1.** Pandemic Events Occurred Worldwide

Name of the pandemic	Year of the event
Plague of Athens (Typhoid Fever)	430 BC
Antonine Plague (Small pox)	165-180
Plague of Cyprian	252-256
Plague of Justinian (Bubonic Plague)	541-750
Black Death	14 <sup>th</sup> Century
Third Pandemic (Plague)	19 <sup>th</sup> Century
Smallpox	1518
Smallpox	1520

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Smallpox	1618-1619
Smallpox	1770
Smallpox	1780-1782 & 1837-1838
1 <sup>st</sup> Cholera Pandemic	1816–1826
2 <sup>nd</sup> Cholera Pandemic	1829–1851
3 <sup>rd</sup> Cholera Pandemic	1852–1860
4 <sup>th</sup> Cholera Pandemic	1863–1875
An Outbreak of Cholera	1866
5 <sup>th</sup> Cholera Pandemic	1881–1896
6 <sup>th</sup> Cholera Pandemic	1899–1923
7 <sup>th</sup> Cholera Pandemic	1962–66
Russian Flu	1889-1890
Spanish Flue	1918-1919
Asian Flue	1957-1958
Hong Kong Flue	1968-1969
H1N1	2009

2020 is a year of pandemic, the whole world suffers from a pandemic disease called COVID-19, and it was started in Wuhan city, china, in December 2019. It has emerged as an outbreak of unexplained pneumonia, later on Feb 2020, the World Health Organization (WHO) named this pneumonia disease as Corona virus Disease-2019 (COVID-19). This novel corona virus disease shows symptoms such as fever, fatigue, dyspnea, myalgia, severe cough, diarrhea etc. This disease spreads through nasal discharge and salivary droplets. This infection is usually mild in Children and young adults, whereas in old people and those with co-morbidities like diabetes, blood pressure, cardiovascular diseases develop severe illness, even death. Unfortunately specific antiviral drugs or vaccines are

currently not available. The drugs used for COVID-19 management is categorized in four classes Antiviral, Anti-inflammatory drugs, Anti-malaria drugs, Traditional Medicine. The researches are going on in both Biomedicine and Traditional medicine at both Clinical and Pre-clinical level, to prove its efficacy and safety. Hence, the lack of potential drug against COVID-19 in conventional medicine turns the world attention towards traditional medicine in various countries like China, Iran, India, etc.

Siddha system of medicine is one of the primordial system of medicine, has its origin in southern part of India. Siddhars are spiritual scientist, who wrote many medicine preparations using herbs, metals, minerals and some animal products too. They have mentioned 32 types of internal and 32 types of external medicine not only for curative health, but also for preventive and promotive health. Siddhars have mentioned 4455 diseases, definitions, types and its management, initially it was written in palm leaf, later it is converted into printed books. This manuscript critically review the pandemic/ epidemic mentioned in Siddha system, its management mentioned in Siddha system, previous pandemic/ epidemic management through Siddha system, and current pandemic (COVID-19) management through Siddha System.

## 2. PANDEMIC OR INFECTIOUS DISEASES IN SIDDHA SYSTEM (*KOLLAI NOI/OTTU NOI*)

In Siddha system of medicine, pandemic is termed as *kollainoi*. It is defined as, the disease which occurs spontaneously, spread rapidly, affects abundant humans in a district or state or even whole country. This may occur during climatic changes, from February to May months. Another term used in Siddha system for infectious diseases is *Ottunoi*. The diseases which are caused by any germ are called as *Ottunoi*. Some important pandemic or infectious diseases, in Siddha are small pox (*ammai*) and Cholera (*Vulinoi*).

### 2.1. Siddha Mode of transmission of Infectious diseases (*Ottunoi*)

1. The disease will spread via infected person excretions such as respiratory droplets, sputum, urine, feces, etc.
2. It may also spread by touching the objects handled by an infected person.

#### 2.1.2 Small pox (*Ammainoi*)

The disease which starts with fever, later causing blister in some parts of the body or all over the body is called as Small pox (*Ammainoi*). There are 14 types of small pox in Siddha system.

#### 2.1.3 Cholera (*VuliNoi*)

Cholera is disease causing vomiting, diarrhoea, indigestion, dehydration. It will occur as a pandemic between the month of August and October. The other name of the *vulinoi* is *natpunoi*, which indicates, it is an infectious and contagious disease.

### 2.2. Pandemic management in Siddha

In Siddha, the pandemic is managed with 4 steps (Durairasan. ko, 1993) they are,

#### 2.2.1 Notification

When a person is identified with the diseases, neem leaves (*Azadirachta indica*) and turmeric (*Curcuma longa*) are inserted

in the entrance of the house to notify that 'the person inside the house is infected'. In current COVID-19 pandemic, people in home quarantine are noticed with a paper notice stuck at the house entrance, in ancient days it was noticed with neem leaves and turmeric.

#### 2.2.2 House isolation

When a person is infected, the person is isolated from others, to prevent others from infection.

#### 2.2.3 Quarantine

Quarantine is an evidence of ignorance. As soon as the true cause of any disease is recognized, attention is directed to its prevention in the first instance rather than to its suppression after the disease has appeared. To control any disease by means of quarantine we must restrain all infected individuals during their entire period of infection (Bagde S, Shukla P, Srivastava RK, Mondal R & Anupam R., 2019). It was practiced especially in small pox.

- I. When the outbreak incidence starts, no persons are permitted to go outside and come inside the town. Even the visitors are not allowed to go to their home town.
- II. The infected person is isolated in a separate room and lay down in neem leaves spread clean cloth. The cloth and neem (*Azadirachta indica*) leaves should be changed every day. Neem possess potent anti-septic, anti-viral properties against different viruses such as Coxsackie B virus, variola, Chikungunya, dengue, polio, measles (Ruchta .T, Amit Kumar verma, Sandip Chakraborty, Kuldeep Dhama, ShoorVir.S, 2014).
- III. The isolated room is disinfected with turmeric water, blockade with turmeric dipped cloth. Curcumin isolated from curcuma long has Anti-viral, anti-microbial, anti-bacterial activity (Moghadamtousi SZ *et al.*, 2014).
- IV. The family members who stayed with the infected person will not go to other houses, won't share their things with others.

#### 2.2.4 Disinfection

Neem leaves (*Azadirachta indica*), turmeric water (*Curcuma longa*) and Cow dung can be used as a disinfectant. The floor of the house and streets are molded thoroughly with cow dung. Fumigation of *sambirani* (*Styraxbenzoi*), *kungiliyam* (*Shorea robusta*) were also mentioned as disinfected.

Cow dung has antiseptic, anti-radioactive and anti-thermal activities. The traditional fumigation with herbs such as garlic (*Allium sativum*) peel, turmeric (*Curcuma longa*) powder, Carom (*Trachyspermum ammi*) seeds and *Loban* (resin of *Styraxbenzoin* and *Boswellia* species) is effective in reducing air-borne bacteria, disinfect inert surfaces and also improves the quality of air (Surajpalwad, 2017).

### 2.3 Modern history of the epidemic or pandemic management through Siddha system of medicine

Dengue infection is one of the rapid spreading mosquitos borne viral disease in the world which accounts for nearly 50 million cases, annually (Sahanaa C, Mishra AK, Bazroy J, 2018). At the time of dengue epidemic 2012, the Tamil Nadu government distributed a Siddha herbal decoction, *Nilavembu kudineer* (NVK) at free of cost. Health and Family Welfare Department Letter No. 41459/IM1(2)/2012, dated 21.11.2012 stated that "Nilavembu decoction, traditional Siddha drug is effective in

the treatment of viral fevers like dengue". The *Nilavembukudineer* has nine ingredients they are *Nilavembu (Andrographispaniculata)*, *VilamichaiVer (Plectranthusvettiveroides)*, vetiver (*Vetiveriazizanioides*), *Cukku (Zingiberofficinale)*, *Milagu (Pipernigrum)*, *Koraikizhangu (Cyperusrotundus)*, *Santanam (Trichosanthescucumerina)*, *Parpadagam (Mollugocerviana)*. This is not only to treat diseases, but also to prevent diseases. As a result, there is a reduction in morbidity and mortality of dengue fever. The antiviral activity of *nilavembukudineer* was estimated by Jaspreet jainet *al.*, shows, protection against CHIKV and DENV-2 during active infection and also help to prevent virus infection in the cells (Rajalakshmi S, Sathiyarajeswaran P, Samraj K & Kanagavalli K, 2020).

### 3. INDIAN GOVERNMENT POLICIES SUPPORTING SIDDHA SYSTEM OF MEDICINE

#### 3.1 Central Government

Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy systems are the five indigenous systems of medicine practiced in India. Although homoeopathy is of German origin, the system is being practiced in India together with the indigenous forms of medicine. A department called the Department of Indian System of Medicine and Homoeopathy was created in March 1995 and renamed AYUSH in November 2003. Its aim was to give greater attention to the development of these systems of medicine. AYUSH ministry has also released the guidelines to manage COVID-19 pandemic through AYUSH systems of medicine.

##### 3.1.1 Yoga campaign

The Ministry of AYUSH started Yoga at home campaign. In this campaign, they released the Yoga Posture, to counter stress and promote physical and mental well being during lockdown in this pandemic.

##### 3.1.2 AYUSH web portal for COVID-19

Prime Minister Shri Narendra Modi met with representatives of the AYUSH sector, on 28th March 2020, discussed about the COVID-19 outbreak. PM underlined the importance of unproven claims of AYUSH having a cure for the disease. He said scientists from AYUSH, the Indian Council of Medical Research (ICMR), the Council of Scientific and Industrial Research (CSIR), and other research organisations must come together for evidence-based research. As a follow-up of that meeting, the Ministry of AYUSH started a COVID19 input portal on its website. On this portal, any registered AYUSH practitioner can submit a suggestion, concept or proposal about COVID-19. The suggestions received so far, across the country have been made public as advisory from Ministry of AYUSH (T. C. Jame, 2020).

##### 3.1.3 Interdisciplinary AYUSH Research and Development task force

The ministry of AYUSH, government of India No. 17020/1/2020-E.I Dated 2nd April, 2020 established a task force with 17 members of AYUSH experts. This was constituted for initiating, coordinating and monitoring the Research and development (R & D) activities in the AYUSH sector related to COVID-19 disease. Based on this task force AYUSH ministry called for Extra Mural Research (EMR) projects {No.Z-28015/48/2020-HPC (EMR) AYUSH Dated: 21/4/2020}, to support short-term research projects for

evaluating the impact of AYUSH interventions/medicines in the prophylaxis and clinical management of COVID-19 (State Principal Secretaries [Health/AYUSH], 2020, April 21)

#### 3.1.4 Insurance coverage for AYUSH practitioners

Ministry of Health & Family Welfare launched an Insurance scheme for health workers fighting COVID-19 for the period of 90 days {D.O No. Z.18016/1/2020-PMGKP/NHM-II (Pt File ), Dated 10.04.2020}. The Scheme cover all the healthcare providers who have been drafted for COVID-19 related duties, which also includes AYUSH practitioners (Insurance-coverage, Ministry of Health & Family Welfare, Government of India, 2020, April 10).

#### 3.1.5 AYUSH Sanjivani Mobile application

The ministry of AYUSH has developed "AYUSH Sanjivani" mobile application, for analyzing the impact of AYUSH advisories on immunity enhancement. The app will create data on acceptance and usage of AYUSH advocacies and measures among the population and its impact in prevention of COVID-19 (Harsh vardhan, 2020).

#### 3.1.6 AYUSH for immunity campaign

The ministry of AYUSH launched a three month campaign on August 2020 aimed at increasing awareness about easy and affordable practices for enhancing immunity and preventing diseases especially COVID-19. The objective of this campaign is to provide valuable, simple, widely available day to day cooking, as food to prevent diseases (AYUSH for immunity, 2020, August).

#### 3.2 State Government of Tamil nadu

##### 3.2.1 Aarokyam scheme

Health and family welfare {G.o. (Ms). No.201 dated 23.04.2020} implemented "Aarokyam" Special programme with AYUSH Interventions for COVID-19, for immune enhancement. This scheme insist the use of Siddha medicines (KabasuraKudineer/Nilavembukudineer) for mild COVID-19 cases along with the allopathy treatment. Further insist the use of Siddha medicines (AmukkaraChooranamMathirai, Nellikailegium) in convalescence period too. Along with the above Siddha medicines, some Ayurveda, Unani, homeopathy medicines, yoga postures, immunity enhancing fresh juices and hot drinks are also recommended in this scheme (Aarokyam, Ministry of health & Family welfare, Government of India, 2020, April 23).

##### 3.2.2 Siddha medicine for Frontline workers

Health and family welfare Department (letter no. 1714/P1/2020-1, dated 25.04.2020), recommended Siddha medicines (KabasuraKudineer/Nilavembukudineer) to the police personnel, Healthcare workers, other persons who are in COVID-19 duty, with high risk and low risk in containment area (Ministry of Health & Family Welfare, Government of India, 2020, April 25).

##### 3.2.3 Stand alone Siddha COVID Care Centers in Tamilnadu

Tamilnadu government has established Siddha care centers for treating COVID-19 patients at 29 places with 100-1000 beds. So far 75,000 COVID-19 patients have been treated under Siddha system of medicine as of 1st August 2020. Traditional food items and herbal concoctions were being given as a part of treatment. Siddha medicines such as Kabasurakudineer, Amukkarachooranam, Nellikailegium, Adathodaimanapagu are used along with herbal steam inhalation, gargling, millet snacks,

turmeric milk, and herbal tea. Siddha yogam, meditation, Varmam (Physical manipulation) techniques were taught to the Covid-19 patients. Herbal mask, Herbal water spray, used as an environmental sanitation are other significant practices in Siddha Covid care center. Asymptomatic COVID-19 positive patients and those with mild symptoms are provided treatment at Siddha care center with Siddha medicines alone. Also in other biomedicine hospitals in tamilnadu, integrated treatment was given for COVID-19 patients (Health minister, C. Vijayabaskar, The Hindu, 2020, August 1).

#### 4. EMERGENCY USE OF UNPROVEN INTERVENTIONS OUTSIDE OF RESEARCH, WHO GUIDELINES FOR RESEARCH DURING THE OUTBREAK

World Health Organization (WHO) released a guidance document on ethical issues that arise specifically in the context of infectious disease outbreaks at the time of the Ebola outbreak in West Africa (2014–2016). In that, WHO recommended the use of unproven intervention at the time of infectious disease outbreak, provided,

- I. No proven effective treatment exists.
- II. It is not possible to initiate clinical studies immediately.
- III. Data providing preliminary support of the intervention's efficacy and safety are available, at least from the laboratory or animal studies, and use of the intervention outside clinical trials has been suggested by an appropriately qualified scientific advisory committee on the basis of a favorable risk–benefit analysis.
- IV. The appropriate country authorities, as well as an appropriately qualified ethics committee, have approved such use.
- V. Adequate resources are available to ensure that risk can be minimized.
- VI. The patient's informed consent is obtained.
- VII. The emergency use of the intervention is monitored, the results are documented and shared in a timely manner with the wider medical and scientific community.

The application of experimental interventions under these circumstances is referred to as “monitored emergency use of unregistered and experimental interventions” (MEURI) (World Health Organization, 2016)

#### 5. Preparedness in pandemic outbreak- Challenges and Recommendations- Siddha Practitioner perspective

Although WHO recommended the use of unproven intervention at the time of infectious disease outbreak. In order to build confidence and trust of the public and also from the government policy makers, the preparedness is imperative and they are listed below (Table 2).

**Table 2.** Preparedness of Siddha system of medicine in pandemic outbreak- Challenges and Recommendations

S.no	Challenges	Recommendations
1.	Safety Evaluation	Strengthening Pharmacovigilance

2.	Efficacy Evaluation	Conducting Randomized controlled clinical trials and Meta analysis
3.	Cross-references, cross-learning and collaborations between the Biomedicine and Siddha medicine	Siddha medicine as a part of the M.B.B.S curriculum
4.	“Solidarity” clinical trial in Siddha medicine	Establishment of international policy for Siddha medicine utilization

#### 5.1 Evaluation of safety

For any drug, the safety is evaluated through the pre-clinical toxicity studies (In-vivo acute and sub-acute toxicity studies, In-vitro studies) and clinical studies. According to WHO guidelines for traditional medicine, evidence obtained from the clinical trials is considered as Grade-A proof (World Health Organization, Geneva; 2000). In a study of David NziokaMutua *et al.* revealed that, the evaluation of side effects in large clinical trials for herbal extracts is absent and in adequate (Mutua ND, Juma KK, Munene M, Njagi ENJ, 2016). In the same way the research in pre-clinical toxicity studies in Siddha medicines are more, whereas the clinical safety studies, Adverse Drug Reaction (ADR) reporting publications are not enough. This may be because, the misconception of Siddha practitioners is that the particular drug will be banned in the future when it is reported against ADR.

#### Strengthening Pharmacovigilance

Publications, documentation of side-effects (recorded according to established principles of Pharmacovigilance) of a single herb or compound herbal preparations or herbo-mineral preparation is needed. Reporting, publishing case report and case series related to ADR will built up a trust to biomedical practitioners and also ease the policy making. Such reports should be attached in Under Graduate (UG) Siddha curriculum itself to give confidence to budding Siddha practitioners. ADR related awareness classes should be conducted to avoid the misapprehension in Siddha practitioners as well as in students.

#### 5.2. Evaluation of Efficacy

The limited evidence for efficacy remains a challenge to use of Siddha medicines. One of the concerns of healthcare administrators and policy makers is absence of clinical trial in Siddha system of medicines.

#### Conducting Randomized controlled Trials and Meta analysis

Though the Tamilnadu government recommended Nilavembukudineer at the time of the epidemic, there is no evidence of randomized clinical trials. As per WHO guidelines Evidence obtained from meta-analysis of randomized controlled Trials is considered as grade-A proof. Such studies facilitate the acceptance of Siddha medicines in different regions.

#### 5.3. Cross-referencing, cross-learning and collaborations between the Biomedicine and Siddha medicine

In an assessment of the mainstreaming of AYUSH in Rajasthan, India [Society for Economic Development and Environmental Management (SEDEM) n.d.], revealed that AYUSH is popular and regularly accessed by the community. Approximately half the allopathic doctors studied reported never referring patients to AYUSH doctors; there is a sharp status gap between modern medicine and AYUSH (Boovaragasamy C, Narayanan S., 2019).

The allopathic alleges that standards of medical care would be diluted after the integration.

#### **Siddha medicine as a part of curriculum**

AYUSH medicine should be included in the Bachelor of Medicine and Bachelor of Surgery (MBBS) curriculum itself, it should include, varmam, yoga, preventive measures in Siddha, strengths of Siddha medicine (for example excellent in treating skin diseases, liver disorder, renal stone, peptic ulcer, musculoskeletal disorders etc. ), the science of Siddha, ongoing research in Siddha. Sulochanabhat *et al.* conducted a study on 202 Biomedicine practitioners; the study revealed that all the respondents were aware of basic principles and strengths of Ayurveda. They also opined that, integration is helpful to strengthen the overall health care delivery in India. Further, they uttered that the communication barrier between practitioners of Ayurveda and Biomedicine, research work with respect to safety and efficacy of Ayurvedic medicines and therapies, inadequate policy initiatives are the important obstacles in implementing integration between Ayurveda and Biomedicine (Sulochana Bhat, Saketh Ram Thirigulla, N Srikanth, M.M. Padhi, Kartar Singh Dhiman, 2015). The integration of education, research and practice of both systems at all levels will happen only if both Siddha and biomedicine practitioners should appreciate the relative strengths, weaknesses, and role of each system.

#### **5.4. “Solidarity” clinical trial in Siddha medicine**

“Solidarity” is an international clinical trial to help discover an effective treatment. This was launched by the World Health Organization and partners during COVID-19 pandemic. The Solidarity trial is one in which four treatment options is compared against the standard care, to assess their relative efficacy against COVID-19. By enrolling patients in various countries, the Solidarity trial aims to rapidly discover whether any of the drugs slow disease progression or improve survival.

#### **Establishment of international policy for Siddha medicine utilization**

A solidarity clinical trial in Siddha system is possible by the cooperation of other countries like China with strong traditional medicine systems. The relevant protocols will have to be got approved by the World Health Organization. That would require considerable diplomatic effort and documentation.

## **6. CONCLUSION**

Siddha system of medicine has rich knowledge about various pandemic diseases and its preventive measures and management. Pandemic is not new to Siddha system it is dealt 2000 years before by siddhars. Prevention and management of pandemic through Traditional medicine is vital in this era. The well established research works in the safety and efficacy of Siddha medicine, Cross referral, cross learning between Siddha and Biomedicine practitioners, establishment of international polices for Siddha medicine are the measures to be taken in the future. This has to be supplemented by active research, development, standardization of Siddha medicine. The preparedness helps the government to initiate an immediate response and fulfils the expectations from the public and builds their confidence and trust. With that we can tackle the outbreak, prevent their spread and save human lives.

## **AUTHOR’S CONTRIBUTION**

Samraj. K made the outline of the article, Rajalakshmi. S wrote the whole article, Sathyarajeswaran. P validated and gave inputs to the article, Kanagavalli. K did overall supervision.

## **CONFLICT OF INTEREST**

The authors have no conflicts of interest to declare.

## **REFERENCES**

Bagde S, Shukla P, Srivastava RK, Mondal R, Anupam R. Validation of environmental disinfection efficiency of traditional Ayurvedic fumigation practices. *J Ayurveda Integr Med.* 2019;10(3):203-206.

Boovaragasamy C, Narayanan S. Utilization of AYUSH in public health care system: a review. *Int J Community Med Public Health.* 2019;6(6):2730-2732.

General Guidelines for Methodologies on Research and Evaluation of Traditional Medicine World Health Organization, Geneva; 2000.

Guidance for managing ethical issues in infectious disease outbreak, World Health Organization, 2016.

Harsh Vardhan. ‘AYUSH Sanjivani’ App and inter-disciplinary studies involving AYUSH interventions for COVID 19, 2020:1-2. Available at: <https://pib.gov.in/PressReleasePage.aspx?PRID=1621787>(Accessed on: 17 May2020).

Insurance-coverage, Ministry of Health & Family Welfare, Government of India, 2020. Available at: <https://www.cmchistn.com/covid/insurance%20scheme%20for%20health%20workers%20fighting%20covid19.pdf> (accessed on 10 Apr 2020).

Ko. Durairasan. *Noi Illa Neri.* (3rd edition, ed.). Chennai: Directorate of Indian Medicine and Homeopathy; 1993.

MdInsiat Islam Rabby. Current Drugs with Potential for Treatment of COVID-19 : A Literature Review : Drugs for the Treatment Process of COVID-19 Current Drugs with Potential for Treatment of COVID-19 : A Literature Review, *J Pharm Pharm Sci.* 2020;23:58-64.

Ministry of Health & Family Welfare, Government of India, 2020. Available at: [https://www.tn.gov.in/go\\_view/dept/11?page=2](https://www.tn.gov.in/go_view/dept/11?page=2) (Accessed on 23 Apr 2020).

Moghadamtousi SZ, Kadir HA, Hassandarvish P, Tajik H, Abubakar S, Zandi K. A Review on Anti bacterial, Antiviral, and Antifungal Activity of Curcumin, *BioMed Research International.* 2014; 1-12.

Mutua ND, Juma KK, Munene M, Njagi ENJ. Safety, Efficacy, Regulations and Bioethics in Herbal Medicines Research and Practice. *J Clin Res Bioeth.* 2016;7: 266.

Rajalakshmi S, Sathiyarajeswaran P, Samraj K, Kanagavalli K. Review article a review on scopes, methods and rationale of integrative approach in siddha medicine with biomedicine. 2020;12(4):10-15.

RuchtaT, Amit Kumar verma, Sandip Chakraborty, KuldeepDhama, ShoorVir.S, Neem (Azadirachtaindica) and its potential for safeguarding health of animals and humans: A review, *J. Biol. Sci.* 2014;14(2):110-123

Sahanaa C, Mishra AK, Bazroy J, Trend of morbidity and mortality of dengue in Tamil Nadu. *Int J Community Med Public Health* 2018;5(1):322-325.

Samal J. A historical exploration of pandemics of some selected diseases in the world. *Int J Health Sci Res.* 2014;4(2):165-169.

State Principal Secretaries (Health/AYUSH), AIIA/National AYUSH Institutes. 2020:28015. Available at: <https://main.ayush.gov.in/sites/default/files/National%20AYUSH%20Mission%20.pdf> (Accessed on 18 May2020).

Sulochana Bhat, Saketh Ram Thrigulla, N Srikanth, M.M. Padhi, Kartar Singh Dhiman. Integration of Ayurveda with Biomedicine: A Response Identification Cross Sectional Survey. *AYUSHDHARA.* 2015;2(5):1-5.

Surajpasalwad. Feasibility study of cow dung ash as a disinfectant in water, *Global Research and Development Journal for Engineering.* 2017;4(7):28-35

T. C. Jame, AYUSH Systems and COVID-19 Epidemic. *FITM POLICY BRIEF.* 2020;(5):1-6.

Yang Y, Islam S, Wang J, Li Y, Chen X. Traditional Chinese Medicine in the Treatment of Patients Infected with 2019-New Coronavirus (SARS-CoV-2): A Review and Perspective. *Int. J. Biol. Sci.* 2020;16:1708-17.

Web MD. Pandemic. Available at: <https://www.webmd.com/cold-and-flu/what-are-epidemics-pandemics-outbreaks> (Accessed on 10 Apr 2020).