

Exploratory Study on Siddha Diagnostic Tests and Medicine For Covid-19

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Abstract: The novel coronavirus (named “2019-nCoV”) causes severe respiratory illness that was first identified in Wuhan City, Hubei Province, China. The developing countries as well as developed countries along with WHO are struggling to control the pandemic effectively. Meanwhile, the pace of growth of diagnostic tools and treatment procedures could not compensate for the tremendous spread of this disease. Here, our perspective study describes the utilization of traditional medical knowledge in diagnosis and treatment. Siddha medicine is the traditional medical system of Tamilnadu in India. There are several diagnostic methods and treatment procedures which have been practiced for thousands of years by Siddhars. Some traditional practices might be helpful to overcome the outbreak through their valuable siddha formulations. Our perspective study describes the Siddha diagnostic tools based on smell, taste senses and pulse reading (Naadi). Also, the herbal medication Kabavadhasura kudineer (KVSK) considered as potential drug for Covid-19. KVSK is the polyherbal formulation contains 12 herbal ingredients.

Keywords: Covid-19, Kabavadhasuram, Kabavadhasura kudineer, Naadi (Pulse reading), Siddha Medicine, Smell identification test, Taste identification test.

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Abbreviations

COVID 19	-	Coronavirus disease 2019
KVSK	-	Kabavadhasurakudineer (Siddha proprietary Medicine)
SARS COV 2	-	Severe acute respiratory syndrome coronavirus 2
PCR	-	Polymerase Chain Reaction
ACE 2	-	Angiotensin Converting Enzyme 2
UPSIT	-	University of Pennsylvania Smell Identification Test
AROMA	-	Affordable Rapid Olfaction Measurement Array
ROS	-	Reactive Oxygen Species
NADPH	-	Nicotinamide Adenine Dinucleotide Phosphate Hydrogen

I. Introduction

The Covid-19 is a human to human spreading disease and easily clamps human through droplets generated when an infected person coughs or sneezes or through droplets of saliva or discharged from the nose. Covid-19 is an infectious disease caused by Severe Acute Respiratory Syndrome coronavirus-2, till now there is no specific medicine to prevent or treat Covid-19. Social distancing is the only tool to stymie the spread of coronavirus. Many people have been tested coronavirus by kits that relies on PCR which amplifies SARS CoV 2 RNA from patient's swab [1]. There has also been a question of the availability of testing kits including the reagents needed to test the SARS CoV 2, now we are in the position to identify the Covid-19 positive persons to make them quarantine.

To prevent the terrible spread of the Covid-19 every individual should be diagnosed to figure out the positive cases. The testing becomes more important as asymptomatic cases are reported in some areas [2]. It is a big challenge to countries which have huge population. So, by combining modern diagnostic tests with

traditional diagnostic tools, it will become easy to quarantine positive cases without delay. Anecdotal reports suggest that loss of smell may be one of the first symptoms of Covid-19. 70% of patients, who tested positive for Covid-19 without other typical symptoms, are experiencing Anosmia or Ageusia [3]. So, we suggest the smell test and taste test mentioned in *Theraiyar yamaga venba*, a *Siddha* text for suspecting of coronavirus positive cases. Not everyone who flunks a smell test is going to have Covid-19. Olfactory dysfunction is not uncommon symptom because it is also caused by respiratory viruses including Influenza, Epstein Barr virus, Rhinoviruses, Parainfluenza virus and Coronaviruses [4]. But the loss of smell and taste in combination with other common symptoms are strong predictors of Covid-19 infection [5]. The smell and taste tests in *Siddha* reveal the olfactory, gustatory dysfunction and severity of diseases by mentioning the time of death in poem. It can be easy to isolate people who failed in these tests. The ancient *Siddha* medicine proposes that the balance in three humours (*vadham, pittam, kabam*) is essential for the body health. If any vitiation of these humours, it will cause diseases. So, Covid-19 also suggested to be analysed in the basis of three humours.

II. Materials and Methods

2.1 Data search and Selection strategies

The search was conducted to cover the period March 10 to May 8, 2020. Several databases were used for search strings. Covid-19, Anosmia (loss of smell), Olfactory disorders, Ageusia (loss of taste), Dysgeusia, Neutrophils, Reactive Oxygen Species, Pharmacological actions of ingredients of *Kaba Vadha Sura Kudineer* are the keywords used as search strings. Classical *Siddha* books were searched on the citations on the keywords *Kabavadhasuram, Kaba vadha Nadi*, properties of increased and decreased humours. Studies which have indexed peer-reviewed articles and few non reviewed articles are included. Studies which have improper data and full article not available were excluded. Online magazines which updated the latest information about the Covid-19 were also referred. Till date the exact mechanism of Covid-19 virus pathophysiology not yet discovered. Here we analyse several hypothetical Covid-19 pathophysiology research papers.

2.2 Data analysis

N = number of articles referred

From databases n = 80

After screening n = 46 are extracted and reviewed. Among 46 articles, 44 are fully reviewed,

2 are non-reviewed, 12 are related to the phytochemical investigation of herbs which are ingredients of KVSK.

2.3 Smell and Taste are primary Symptoms for COVID-19

A study conducted in Italy on March 19, 2020 shows that, among 59 hospitalized patients, 20(33.9%) reported at least one either taste or olfactory disorder and 11(18.6%) are presented the both symptoms. The 12(20.3%) patients presented the symptoms before the hospital admission, whereas 8(13.5%) experienced the symptoms during their hospital stay. Taste alterations were more frequent before hospitalization (91%) whereas after hospitalization taste and olfactory alterations appeared with equal frequency. All patients reported the persistence of the disorders during their interview [6]. The American Academy of Otolaryngology- Head and Neck Surgery said symptoms of Anosmia (lack of smell) and Dysgeusia (altered taste) to be added to the list of screening tools for Covid-19 [7]. SARS-COV enters the brain primarily via the olfactory bulb demonstrated in mice models [8]. The analysis of bulk and single cell RNA-seq datasets have identified the ACE2 involved in SARS-COV2 entry present in olfactory epithelium support cells and stem cells in both mouse and human datasets [9]. The ACE 2 receptor which is used by SARS-COV2 to bind and penetrate the cell is widely expressed on the epithelial cells of mucosa of oral cavity [10].

2.4 Siddha Diagnostic Tools

In *Siddha* medicine unique methodology of diagnosis is known as *Envagaitervu* (criteria for examination) which includes

- *Naadi*(pulse)
- *Sparism*(skin)
- *Naa*(tongue)
- *Niram*(colour)
- *Mozhi* (speech)
- *Vizhi*(eye)
- *Malam* (Stool)
- *Moothiram*(urine)

In addition, *Siddhas* mentioned the signs of impending death through smell, taste, stool, sound, pulse, etc. Among these smell and taste test may be applied to people as diagnostic tools of covid-19 with less manpower.

2.4.1 Taste identification test

“*Kaipinimai yāmpiramai kāraluvar kālpparun*
Kaipinimai yāmpiramai kanmārir-kaipinimai
Varamadhi pakkaminri vaika rithiyiruthai
Varamadhi pakkamāl vār”. [11]

This poem says about the six tastes i.e. sweet, sour, salt, pungent, astringency, bitter and death recognition of a person who sensed alternative taste. If a person cannot sense a particular taste but it can be sensed from the other five tastes alternatively, by considering that taste (which he cannot sense) we can conclude that he will die within the time duration of death as in poem of *Theraiyar Yamaga venba* (Table A).

Table A

Affected tastes and Death recognition mentioned in *Theraiyar Yamaga venba* a Siddha text.

AFFECTED TASTES	DEATH RECOGNITION
Astringency	within 24 minutes
Pungent	within ½ day
Salt	within 1 day
Bitter	within 1 week
sour	Within 15 days
Sweet	Within 1 month
If astringency is not sensed but is tasted from other all 5 taste foods – The person will die within 24 minutes If pungent is not sensed but is tasted from other all 5 taste foods – within ½ day If salt is not sensed but is tasted from other all 5 taste foods – within 1 day	If bitter is not sensed but is tasted from other all 5 taste foods – within 1 week If sour is not sensed but is tasted from other all 5 taste foods - within 15 days If sweet is not sensed but is tasted from other all 5 taste foods – within 1 month

2.4.2 Smell Identification Test

“*Āmbal kanithālai yārmathalai sāthimarai*
Yāmbal kanikadigai yāmithithi- āmbakani
Thinga liruthayanaj cheppumara nakkurippu
Thinga liruthayanran sēr” [11]

This poem says about the seven flowers and death recognition of a person who sensed alternative smells. If a person cannot sense a particular flower smell but it can be sensed from other all 6 flowers, by considering that flower which he can not smell we can conclude that he will die within the time duration of death said in poem of *Theraiyar Yamaga Venba*. Time period of death said in *Theraiyar Yamaga Venba* indicates the severity of disease. (Table B)

Table B

Herbal flowers and death recognition mentioned in *Theraiyar Yamaga Venba* a Siddha text.

HERBAL FLOWERS	DEATH RECOGNITION
<i>Bambusa arundinacea</i>	Within 7 seconds
<i>Pterocarpus marsupium</i>	Within 2 hour 48 minutes
<i>Pendanus tectorius</i>	Within 12 hours
<i>Bauhinia racemosa</i>	Within 7 days
<i>Cassia fistula</i>	Within one month
<i>Michelia champaca</i>	Within 2 months
<i>Nelumbo nucifera</i>	Within 5 months

For instance, if a person cannot smell *Bambusa arundinacea* but that smell comes from all 6 flowers according to *Theraiyar* he will die within seven seconds.

2.5 Advantages of Siddha diagnostic tools

Anosmia, Hyposmia, Dysgeusia can be easily detected. Grades of Anosmia are also detectable. It can overcome the problem of inadequate testing kits including the reagents needed to test Covid-19. Since this type of testing is easy, it also requires less manpower.

Smell and taste identification tests may be used to predict the pre-symptomatic and asymptomatic Covid carriers. Severity of the illness of a person who failed to smell the flower can be found through knowing the time of the death mentioned in *Theraiyar Yamaga Venba*.

If one person fails to smell *Bauhinia racemosa* flower, he is under greater severity than those who fails to smell *Cassia fistula* flower. Here we suggested that Covid-19 confirmation tests should be taken to the person immediately. By knowing severity using the traditional tests, unnecessary deaths can be avoided.

2.6 Disadvantage of Siddha diagnostic tests

Smell identification test has the drawback in which the availability of the flowers for testing varies according to the place and the flowering season.

2.6.1 Solution for disadvantage

Aroma of the flowers is due to the emission of volatile oil compounds by the floral tissues(like the petals). So, to overcome the questionable availability of these flowers, usage of volatile oil compounds infused cards and tokens can be used. We suggest microencapsulated volatile oils contained scratch and sniff cards like UPSIT which contain strips embedded with microencapsulated odorants [12] and AROMA a novel essential oil based test [13].



Model picture of Traditional volatile oil compound encapsulated smell card picture is given in Figure A.

2.7 COVID-19 a Kabavadha Disease

96 *Tattva* (principles) constitute the human body is the basis of *Siddha* medicine. The three humours *Vadham*, *Pitham*, *Kabam* are inclusive in that 96 principles. The physiological function in body is mediated by three humours. When they vitiated, they bring about diseases peculiar to their influence. So, the normal physiological functions of human carried out by the three humours, any vitiation in humours leads to pathological condition. Diseases named in the basis vitiated humours. If the single humour is provoked, according to the humour it can be called *Vadha* disease, *Pitha* disease, *Kaba* disease. If two humours are provoked, the higher instances should be named first and less provoked second as *Vadha pitha* disease, *Kaba Pitha* disease, *Kaba Vadha* disease and so on.

2.7.1 Justification.1

From table C, it can be concluded that most of the signs and symptoms of Covid-19 mentioned by WHO [1] are similar to symptoms of provoked *kabam*.

Table C
Similarities between elevated *kabam* and COVID-19 signs and Symptoms.

CAUSES BY ELEVATED KABAM [14]	COVID-19 SIGNS AND SYMPTOMS BY WORLD HEALTH ORGANISATION (WHO) [1]
(i) <i>Udal kattukal thalarthal</i> (weak joints)	Arthralgia (14.8% of patients) [1]
(ii) <i>Irumal</i> (cough)	Cough (67.7% of patients) [1]

(iii) <i>Iraippu</i> chest stiffness with pain and difficulty during breathing) [15]	Pain or pressure in the chest, breathing trouble are warning signs of COVID [16]
(v) <i>Migu thookam</i> (excessive sleep)	Due to Cytokine storm excessive daytime sleep can occur [17]
(vi) <i>Agni mandham</i> (reduced <i>pitha</i>)	Reduced activity of <i>pitha</i> can cause digestive symptoms [18]
(vii) <i>Udalveniramadaithal</i> (Pale skin)	38.1% of patients caused by fatigue. Fatigue causes pale skin [19].
(viii) <i>Kulirchi</i> (chills)	11.4% of patients experience chills. [1]

The provoked *kabam* and its types cause major Covid-19 symptoms said by WHO [1]. Five types of *kabam* are, *Aliyaiyam*, *Neerpiyaiyam*, *Suvaikanaiyam*, *Tharpagam niraivaiyam*, *Sandhigam ondriyaiyam*, Based on Siddha principle, nausea [1], vomiting [1], Diarrhoea [1] and fever [1] due to indigestion caused by provoked *Neerpiyaiyam*.

Loss of taste [7] caused by provoked *Suvaikanaiyam*. Symptoms in five sense organs, conjunctival congestion [1] (eye), nasal congestion [1] (nose), Loss of hearing [20] (ear), Fatigue [1] cause pale skin (skin) [19], Loss of taste [7] (tongue) caused by provoked *Tharpagam niraivaiyam*. Arthralgia [1] caused by provoked *Sandhigam ondriyaiyam*. The provoking of *Aliyaiyam* occurred by the changes of four other types of *kabam*. This may cause pneumonia [1], respiratory failure [1] in COVID-19 because it is a basic tool for the function of lungs [14].

“*Vāyuvil Kulirchithān Kudidilo
Vandhidum naligalum varridathae...*” [14]

When *vadham* is mixed with provoked *kabam*, *vadham* will not only get expanded in its place (below umbilicus) but also somewhere else (*piranilai vazharchi*). The remaining symptoms of COVID-19 are dry cough [1], sore throat [1], breathing difficulty [1] caused by vitiated *Pranan*, vomiting [1] caused by vitiated *Udhanan*, diarrhoea [1] caused by vitiated *Abanan*. The more provoked *kabam* and less provoked *vadham* decrease the action of *pitham* in the trunk region (place of *pitham*). This leads to rapid depletion of *Pranavayu* because it is functioned by *pitham*.

“*Thānāna pitta pin kalaiyai patric
Sāivāna prānavāyu vadhanai cernthu*” [14]

Malfunction of *pranavayu* may cause the severe conditions of Covid-19 like Dyspnoea [1], Respiratory failure [1] and multiple organs failure [1].

Thus, Covid-19 may cause primarily by provoked *kabam* and secondarily by provoked *vadham*. So, Covid-19 is considered as *kabavadha* disease.

2.7.2 Justification.2

Naadi (pulse) is one among the Diagnostic tools of Siddha medicine. Pulse reading is an art of *siddhars*. The derangement of humours can be detected through pulse reading. By detecting deranged humour of a person, it can be concluded that person is being affected or will be affected by the diseases which mentioned in *Siddhars' naadi* poems.

“*Kandayō silaerpanathil Vadha nādi kalanthidukil vayirporumalkanathavēkam
Undālō ōngārajsaththivikkaluruthiratchai vāivuvai sannithodam
Vindālō ilaipirumal sōgai pāndu vidapāgam vidadūlai pakkavādhan
Thindādum nāsikā pēdakankal siranōigal palathum vandhu sirakunthānē*” [14]

It is the poem of *Kabavadhanaadi* which describes that *kabavadhanaadi* leads to following diseases. We correlate the diseases of *Kabavadhanaadi* to Covid-19 complications.

- *Vayirru porumal* (Stomach upset),
- *Okkalam* (Nausea),
- *Vandhi* (Vomiting),
- *Vikkal* (Hiccup),
- *Thiratchai vaayu Vali* (Abdominal pain).

These are digestive symptoms which are reported by several COVID-19 positive cases in China as well as United States.[21]

- *Ilaippu* (Fatigue)
38.1% of covid-19 patients caused by Fatigue [1].
- *Irumal* (cough)

67.7 % of covid-19 patients are caused by cough [1].

- *Naasi noigal* (Nasal disorders)

Loss of smell [7], Nasal congestion [1], Rhinorrhoea [22] can be the presenting symptoms of Covid-19.

- *Sira noigal* (Head diseases)

13.6 % of Covid-19 patients caused by headache [1].

- *Kanatha veekam* (lymphadenopathy)

It may be comparable to lymphadenopathy. If not more, little Covid-19 patients suffered by lymphadenopathy. Particularly mediastinal lymph node enlargement is greater in critically ill covid-19 patients [23].

- *Vida soolai* (Stabbing pain)

Stabbing pain in Covid-19 positive case is reported [24]. Centre for Disease Control of America has added achiness in muscles ranging from mild to severe as a new symptom of Covid-19 [25].

- *Pandu, Sobai* (Anaemia)

Anaemia develops in the conditions of infection and inflammation which is called as Anaemia of Inflammation. Mostly normocytic normochromic anaemia is occurred in Anaemia of Inflammation. Red blood cells production is reduced to by cytokines acting on erythroid progenitors in Anaemia of Inflammation [26]. Though there is no evidence of Anaemia to date, the chances of occurrence are high because the presence of cytokine storm in Covid-19.

To correlate the remaining diseases of *kabavadhanaadi* with complications of Covid-19, the pathophysiology of covid-19 should be gone through. To date the exact pathophysiology of Covid-19 virus is not discovered. So, we analyse several hypothetical Covid-19 pathophysiology research papers.

Neutrophils are the prominent cells of innate immunity. These neutrophil counts are higher in Covid-19 patients [27]. Neutrophil extracellular traps are one of the actions of neutrophils. NETosis is the process of neutrophil extracellular traps generation. Several viruses stimulate neutrophils to generate NETs [28],[29]. Though NETosis is the mechanical entrapment of virus, it leads to overactive inflammatory response such as cytokines storm as a double-edged sword. To date there is no data about the NETs in covid-19. NETs are source of extracellular histones which have the role of contribution in ARDS and sepsis [30]. The advanced stage of covid-19 is often due to cytokine storm with ARDS like condition [31]. During NETosis Reactive Oxygen Species are produced by neutrophils through activation of NADPH oxidase [32]. Oxidative stress is an imbalanced condition between Reactive Oxygen Species and antioxidant defences. The excess ROS oxidize the proteins and lipids of not only virus infected cells but also normal cells. A research hypothesize that increased ROS alter fluid balance by modifying are damaging the epithelial sodium channels leads to oedema. Another study reveals that oxidative stress upregulates the nuclear transcription factor (NFkB) in pulmonary oedema development [33]. So, *Vida bagam* (Exaggerated condition) can be considered as the overactive inflammatory condition of Covid-19 patient. *Vidabagam* is characterized by edema on particular part (may be in the lung as in Covid-19) with some bad prognosis symptoms leads to spread of *vadha* to whole body which acts as a poison (may be NETs formation or ROS in other organs as in Covid-19) causing death[34].

Neutrophils through NETosis act as an important contributor to the thrombus formation and progression in the blood vessel [35]. ROS involve in coagulation, platelet reactivity and sterile inflammation such as NETosis and promote the formation of Venous thrombi [36]. Some observations are made by researchers indicate arterial thrombosis strongly correlates with the oxidative stress [37]. Several research studies have confirmed that Covid-19 has thrombotic complications as stroke. Stroke is a presenting symptom of Covid-19 which is one of the main causes of paralysis [38]. *Pakkavadham* is a siddha medical term for paralysis. Although there is no evidence of paralysis to date, the chances of occurrence are high.

- *Sanni*

Sanni is a vitiated state of all the three humors. It is the critical stage of diseases. *Abinniyasa sanni* is one of the types of *sanni*. It is the disease that brings *kabam* as primary [15]. Death is expected within 15 days [34]. Critical stage of Covid-19 is similar to the *Abinniyasa sanni*.

From above two justifications Covid-19 can be considered as *kabavadha* disease. So, Pulse reading (Naadi) also give a good result to diagnose the Covid-19 as it is a *kabavadha disease*. To treat Covid-19, *Kabha Vadha Sura Kudineer* is suggested.

2.8 Kaba Vadha Sura Kudineer:

In *Siddha* medicine *suram* is defined as the appearance of heat due to change in the own state of coldness in the body [15]. There are 64 types of *suram* in *Siddha* medicine which is categorised into 20 are *vadham* related *suram*, 24 are *pitham* related *suram*, 20 are *kabam* related *suram*. Similarly, the Covid-19 fever is appeared as a primary symptom [1] due to the derangement of state of coldness in the body. So, we took covid-19 as a *suram* also. According to symptomatic correlation to three humours of *Siddha*, Covid-19 may cause by primarily by provoked *kabam* and secondarily by provoked *vadham*. There are several powders (*podu*),

decoction (*kudineer*), calcinated form of medicine (*parpam*), red oxide form of medicine (*chendhuram*), tablets (*mathirai*) are used in *Siddha* medicine for *suram*.

Among them we choose *Kaba Vadha Sura Kudineer*.KVSK is the polyherbal formulation for the treatment of *kabavadha suram*. There are 12 ingredients in this KVSK. Drugs applied or suggested for Covid-19 are mostly categorised into Antipyretic, Antimalarial, Antiviral and Anti-inflammatory, Antioxidant, Immunomodulator [39],[40],[41],[42],[43],[44],[45].

Ingredients of KVSK and their Pharmacological actions related to actions of drugs used for COVID-19 are mentioned in Table D.

Table D

Ingredients of *Kaba Vadha Sura Kudineer* and pharmacological actions of each ingredient

INGREDIENTS IN KVSK	PHARMACOLOGICAL ACTION
<i>Kadukkai (Terminalia chebula)</i> <i>Nellikai (Phyllanthus embilica)</i> <i>Thandrikai (Terminalia bellerica)</i> <i>-Thiripala</i>	Antioxidant, Anti-inflammatory, Antipyretic, Immunomodulator [46].
<i>Thippili (Piper longum)</i>	Anti asthmatic, Against respiratory depression, Antioxidant, Immunomodulator [47].
<i>Korai Kilangu (Cyperus rotundus)</i>	Anti-inflammatory, Antipyretic, Antioxidant, Antimalarial [48].
<i>The Frankottai (Strychnos potatorum)</i>	Antioxidant, Anti-inflammatory, Antipyretic [49]
<i>Sensandhanam (Pterocarpus santalinus)</i>	Antioxidant, Anti-inflammatory [50]
<i>Athimathuaram (Glycyrrhiza Glabra)</i>	Antioxidant, Anti-inflammatory [51]
<i>Kostam (Costus speciosus)</i>	Antioxidant, Anti-inflammatory, Antipyretic [52]
<i>Sivanarvembu (Indigofera aspalathoides)</i>	Antioxidant, Anti-inflammatory, Antiviral [53]
<i>Thoothuvalai (Solanum trilobatum)</i>	Antioxidant, Immunomodulator, Anti-inflammatory [54].
<i>Semmulli (Leonotis nepetifolia)</i>	Antioxidant [55].

III. Results and Discussion

Siddha medicine is an Indian medical system it has been practiced by *Siddhars* at Tamilnadu in India. *Siddhars* are pillars of *Siddha* medicine who attained *Attamasiddhis* (spiritual powers). They are *Anima* (Shrinking), *Magima* (Illimitability), *Lagima* (Lightness), *Karima* (Weightiness), *Prapthi* (Desire fulfilment), *Pirakamiyam* (Irresistible will), *Vasithvam* (Domination over the elements), *Ishathvam* (supremacy). Several Diagnostic and treatment methods of *Siddha* medicine are documented as poems on Palm leaves manuscripts in olden days. In addition to eight criteria of physical examination (*Envagai thervu*) there are some signs of impending death through smell, taste, pulse, stool, sound etc. which is also mentioned in *Siddha* texts. Among them smell and taste tests are easily applicable to all, because may be used as self investigative tools. According to *Theraiyar Yamaga Venba*, a person who failed to smell a flower, but he can smell that flower's smell from other all six flowers he will die within the period mentioned in Table B. To overcome the drawback of questionable availability of flowers, we suggest microencapsulated volatile oils contained scratch and sniff cards like UPSIT which contain strips embedded with microencapsulated odorants [12] and AROMA a novel essential oil-based test [13]. Like UPSIT, AROMA etc. Traditional smell identification test also utilises microencapsulated essential oil strips as scratch and sniff cards. The model picture of traditional smell identification test shown in figure A.

Taste identification test is implemented as questionnaire method. Taste identification test also similar to the smell identification test that a person fails to sense particular taste, but it can be sensed from other all 5 taste foods he will die with the particular time duration of death. *Naadi* will also act as a strong diagnostic method for Covid-19.

If these Diagnostic tests are implemented on public, Covid-19 symptomatic persons may be identified. If these tests are implemented on suspected people who are under hospital quarantine, prognosis stage and severity of disease may also be identified.

Another theory about smell and taste sensations as signs of impending death. In Covid-19 fever is a primary symptom [1]. The Siddha concept is,

“Kudal thannil sēdhamallathu suram varāthu” [15]

Explanation: No fever occurs without accumulation of *kabam* humour in intestine.

So, covid-19 is considered as *suram* based on *Siddha* concepts.

Primarily provoked *kabam* cause the derangement of *vadham* which leads to provoke *vadham*. Two third of Covid-19 symptoms caused by provoked *kabam*, remaining one third symptoms by provoked *vadham*. So, Covid-19 is considered as *Kabavadhassuram*. KVSK is one among recommended drug for *kabavadha suram*. It is the polyherbal formulation contains 12 ingredients. Each herb possesses any of the pharmacological actions as Antioxidant, Immunomodulator, Antipyretic, Antimalarial, Anti-inflammatory, and Antiviral. The both Diagnostic tests and KVSK may used to overcome Covid-19 a pandemic.

IV. Conclusion

The study conducted by Indian Council of Medical Research indicated that one patient can infect up to 406 people within 30 days in the absence of self isolation. If social exposure is reduced by 75% then he/she can only affect 3 persons [56]. So, to prevent the rapid spread of coronavirus, the traditional tests such as *Naadi*, Taste and Smell test mentioned in the *Siddha* text *Theraiyar Yamaga Venba* should be integrated with modern diagnostic tools. all the diseases should be looking at the *kuttram* ie, vitiated stage of three humours. Because according to *Siddha* there is no diseases beyond the mastery of three humours. By equalising the vitiated stage of humours, the cruel disease Covid-19 too medicable. As Covid-19 is a *kabavadhassuram*, *Kaba Vadha SuraKudineer* is preferred. We have explained in detail how Covid-19 is classified under *kabavadha disease*. Scientific evaluation is essential to prove the synergistic effect of ingredients in this polyherbal formulation. In future we should elucidate the epidemiological, clinical and several science studies to expose the mechanism underlying these traditional test strategies with advanced research and recent technologies.

Declaration of conflicting interests

None

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References

- [1]. CDC Health Alert Network Advisory Update and Interim Guidance on Outbreak of 2019 Novel Coronavirus (2019-nCoV) in Wuhan, China.
- [2]. China reports 42 new confirmed covid-19 cases, 49 asymptomatic infections, The Hindu, Business line updated on April 10, 2020.
- [3]. Mindy weisberger, loss of smell could be a symptom of COVID-19, Live science online on March 23, 2020.
- [4]. Suzuki et al., Identification of virus in patients with post viral olfactory dysfunction, The Laryngoscope/ volume 117, issue 2, Jan2009.
- [5]. Menni et al., Loss of smell and taste in combination with other symptoms is a strong predictor of COVID- 19 (Non-peer reviewed) doi: 10.1101/2020.04.05.20048421
- [6]. Giacomelli et al., Self-reported olfactory and taste disorders in SARS-COV2 patients: a cross sectional study, clinical Infectious diseases, ciaa330, 26 march,2020.
- [7]. AAO-HNS: Anosmia, Hyposmia And Dysgeusia symptoms of coronavirus Disease, 2020. <https://www.entnet.org/content/aao-hns-anosmia-hyposmia-and-dysgeusia-symptoms-coronavirus-disease> - Accessed 23/03/2020
- [8]. Netland J et al., Severe acute respiratory syndrome coronavirus infection causes neuronal death in the absence of encephalitis in mice transgenic for human ACE2. J virol, 2008; 82(15):7264-7275.
- [9]. David H. Brann et al., Non neuronal expression of SARS-COV2 entry genes in the Olfactory system suggests mechanisms underlying COVID-19 associated anosmia, (non peer reviewed paper), <https://doi.org/10.1101/2020.03.85.009084>
- [10]. Xu H, Zhong L, Deng J et al., High expression of ACE2 receptor of 2019-nCoV on the epithelial cells of oral mucosa, Int J oral sci; 2020;12(1):8.
- [11]. Thiyagarajan R, Theraiyar Yamaga Venba, a Siddha text, Directorate Of Indian Medicine And Homeopathy, Chennai 2003,4th Edition, Government of Tamil Nadu
- [12]. Doty et al., University of Pennsylvania Smell Identification Test a rapid quantitative olfactory function test for the clinic, Laryngoscope1984; 94(2 Pt 1) 176-178.
- [13]. Vill wock et al., _Affordable Rapid Olfaction Measurement Array: A Novel, Essential Oil- Based Test strongly correlated with UPSIT and subjective outcome measures, Annals of Otolaryngology & Laryngology 2020, Vol 129 (1) 39-45.
- [14]. Uthamarayan KS, Siddha maruthuvanga Churukkam, a Siddha text, Chennai: Department of Indian medicine and Homeopathy, 6 th edition, 2018.
- [15]. Kuppaswamy mudaliar KN, Siddha maruthuvam Pothu, a Siddha text, Chennai: Department of Indian Medicine and Homeopathy, 2nd edition, 2012.
- [16]. Centres for Disease Control and Prevention, coronavirus disease 2019 symptoms, <https://www.cdc.gov/coronavirus/2019-ncov/symptoms-testing/Symptoms.html>

- [17]. Vgontzas et al., Elevation of Plasma cytokines disorders of Excessive Daytime sleepiness: Role of sleep Disturbance and obesity, *jcem*.82.5.3950. 01may 1994.
- [18]. Pan et al., Clinical characteristics of COVID-19 patients with digestive symptoms in Hubei, china: a descriptive cross-sectional, Multicentre study, *Am J Gastroenterol*, 2020
- [19]. Sundelin et al., Cues of Fatigue: Effects of sleep Deprivation on Facial Appearance, sleep. 2013 Sep 1; 36(9):1355-1360.
- [20]. Sriviji talai et al., Hearing loss and COVID-19 A note, *Am J Otolaryngol*. 2020 Apr 2:102473.
- [21]. Wong et al., Covid-19 and the digestive system, *J Gastroenterol Hepatol*.2020 mar 25.
- [22]. Lovato et al., Clinical Presentation of Covid-19: A Systematic review focusing on Upper Airway Symptoms, Ear, Nose and Throat journal 1-8, 2020, Apr 13.
- [23]. Vallete et al., Mediastinal lymphadenopathy in patients with severe COVID-19. *Lancet Infect Dis*. 2020 Apr 21.
- [24]. Kim et al., Abdominal and testicular pain: An atypical presentation of COVID-19. *Am J Emerg Med*. 2020 Mar 31.
- [25]. <https://www.cdc.gov/coronavirus/2019-nCoV/hcp/clinical-care.html>.
- [26]. Nameth and Ganz. Anaemia of inflammation. *Hematol Oncol Clin North Am*. 2014 Aug; 28(4): 671-681.
- [27]. Wang et al., Clinical characteristics of 138 Hospitalized patients with 2019 normal coronavirus infected pneumonia in Wuhan, China. *JAMA*. 323:1061
- [28]. Muraro et al., Respiratory Syncytial Virus induces the classical ROS-dependent NETosis through PAD-4 and necroptosis pathways activation. *Sci. Rep*. 2018; 8:14166.
- [29]. Hiroki et al., Neutrophil Extracellular Traps effectively control acute chikungunya virus infection. *Front. Immunol*. 2020; 10:3108.
- [30]. Barnes et al., Targeting potential drivers of COVID-19: Neutrophil extracellular traps. *J. Exp. Med*. 2020 Vol. 217 No. 6 e20200652.
- [31]. Baden et al., Covid-19: the search of effective therapy. *NEJM*. 2020 doi: 10.1056/NEJMe2005477.
- [32]. Almyroudis et al. NETosis and NADPH oxidase: at the intersection of the host defence, inflammation, and injury. *Front. Immunol*. 2013; 4(45):1-7.
- [33]. Sarada et al. Role of Oxidative Stress and NFkB in hypoxia induced pulmonary edema. *Exp Biol Med (Maywood)*. 2008 Sep; 233(9):1088-98.
- [34]. Sambashivam T.V (1994). *Tamil-English Dictionary of Medicine, Chemistry, Botany and Allied sciences*. Chennai: Government Central Press.
- [35]. Thalin et al. Neutrophil Extracellular Traps villains and targets in Arterial, Venous and cancer associated thrombosis. *Arteriosclerosis, Thrombosis, and Vascular Biology*. 2019; 39:1724–1738.
- [36]. Gutmann et al. Reactive Oxygen Species in venous thrombosis. *Int J Mole Sci* 2020 Mar 11. 21(6).
- [37]. Madamanchi et al. Oxidative stress in atherogenesis and arterial thrombosis: the disconnect between cellular studies and clinical outcomes. *J Thromb Haemost*. 2005 Feb;3(2):254-67.
- [38]. Avula et al., (2020). COVID-19 presenting as stroke. *Brain Behav Immun*. Doi: 10.1016/j.bbi.2020.04.077.
- [39]. Wen Zhang et al., The use of anti-inflammatory drugs in the treatment of people with severe coronavirus disease 2019 (COVID-19). The experience of clinical immunologists from china, *clinical immunology*-(25 mar 2020) 108393.<https://doi.org/10.1016/j.clim.2020.108393>
- [40]. Gautret et al., Hydroxychloroquine and azithromycin as a treatment of COVID-19: results of an open-label non randomized clinical trial, *International Journal of Antimicrobial agents*,20 Mar 2020, 105949.
- [41]. Liu J et al., Hydroxychloroquine a less toxic derivative of chloroquine is effective in inhibiting SARS-CoV2 infection in vitro. *Cell Discov* 6, 16 (2020)
- [42]. Wu et al, TH17 Responses in cytokine storm of COVID-19: An emerging Target of JAK2 inhibitor Fedratinib. *Journal of microbiology, Immunology, and Infection* (11 Mar 2020).
- [43]. Fan et al., Repurposing of clinically approved drugs for treatment of coronavirus disease 2019 in a 2019 novel coronavirus related coronavirus model. *Chinese medical Journal: Mar 06, 2020* doi:10.1097/CM9.0000000000000797
- [44]. Wang et al. An anti-oxidative therapy for ameliorating cardiac injuries of critically ill COVID-19-infected patients. *Int J Cardiol*. 2020 Apr 6. doi: 10.1016/j.ijcard.2020.04.009
- [45]. Ingraham et al. (2020). Immunomodulation in covid-19. *Lancet Respir Med*. May 4,2020. [https://doi.org/10.1016/S2213-2600\(20\)30226-5](https://doi.org/10.1016/S2213-2600(20)30226-5)
- [46]. Peterson et al., Therapeutic Uses of Triphala In Ayurveda Medicine, *J Altern Complement Med*. 2011 Aug 1, 23(8),607-614
- [47]. Zaveri et al., Chemistry and pharmacology of Piper Longum L., *International Journal of Pharmaceutical Sciences review and research*, volume 5, Issue 1, 2010; Article 010.
- [48]. Bajpai et al., Medicinal value of *Cyperus rotundus* Linn: An updated review, *Medicinal plants - International Journal of phyto medicine and Related Industries*, 10(3):165 - Sep 2018.
- [49]. Kavitha N et al., *Strychnos potatorum*:Phytochemical and pharmacological review, *pharmacogn Rev*.2014 8(15):61-66
- [50]. Saradamma Bulle et al., Therapeutic potential of *Pterocarpus santalinus* L. An update *Pharmacogn Rev*. 2016 Jan-Jun; 10(19):43-49.
- [51]. Ali Esmail Al-Snafi, *Glycyrrhiza glabra*: A phytochemical and pharmacological review, *IOSR Journal of Pharmacy*, 2018.,8(6)I:01-17.
- [52]. Srivastava et al., *Costus Speciosus* (keukand), a review, *Der pharm Sin* 2011;2(1):118-28.
- [53]. Omprakash et al., *Indigofera aspalathoides* vahl., Ex. DC. (sivanar vembu): A phytopharmacological review, *IJPSR* (2013) VOL.4(10): 3775-3781.
- [54]. Balakrishnan et al., A perspective on bioactive compounds from *Solanum trilobatum* *Journal of chemical And Pharmaceutical Research*, 7(8):2015,507-512.
- [55]. Usharani et al., Evaluation of antioxidant potential of leaves of *Leonotis nepetifolia* and its inhibitory effect on MCF7 and Hep2 cancer cell lines. *Asian Pac J Trop Dis*. 2013 Apr; 3(2): 103–110. doi:10.1016/S2222-1808(13)60053-5.
- [56]. ICMR Study suggests 1 Covid-19 patient can infect 406 people in 30 days in absence of self-isolation: Govt, *Economic times Online*, 7 Apr,2020.

K. Vanitha, et. al. "Exploratory Study on Siddha Diagnostic Tests and Medicine For Covid-19."
IOSR Journal of Dental and Medical Sciences (IOSR-JDMS), 19(5), 2020, pp. 47-55.