Integrative Therapy based on *Yoga* and *Ayurveda* for Treatment of a High-risk Case of COVID-19/SARS-Cov-2 with Multiple Co-morbidities

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Abstract

Background: We report presumably the first known case of a high-risk COVID-19 positive patient with co-morbidities including Diabetes Mellitus (DM), Hypertension (HTN), Hypothyroidism and Chronic Kidney Disease (CKD), treated successfully using an Integrative Therapy plan based on Ayurveda and Yoga. Recently, some evidence has been emerging on the use of Ayurveda for treatment of COVID-19. The classical texts of Ayurvedic medicine such as *Charaka Samhita* and *Sushruta Samhita* contain the description of pandemics of similar proportions and describe them as *Janapadoddhvansa* meaning the destruction of communities, along with their causes and treatment.

Case Presentation: The reported case, a 55 year old male confirmed (tested) patient of COVID-19, who first took modern western medicine

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(MWM) for 7 days before seeking the Integrative Therapy. The patient has comorbidities including DM, HTN, Hypothyroidism and CKD and had developed symptoms including fever (which was resolved by the time Integrative Therapy was started), sore throat, dry cough, body ache, weakness, bad taste and smell, and heaviness in abdomen. Based on the patient's symptoms and co-morbidities, a treatment plan including Ayurvedic medicines, Yoga protocol, dietary recommendations and lifestyle modifications was prescribed by a registered Ayurveda doctor and a Yoga consultant. The patient started experiencing improvement in all the symptoms within 2 days after starting the treatment; he reported approximately 75% relief from the symptoms after 5 days, and almost complete relief within 9 days. Also, the blood sugar levels (both Fasting Blood Sugar FBS, and Post Prandial Blood Sugar PPBS) exhibited significant improvement after 5 days, and came inside the normal range within 12 days. The patient was diagnosed free from infection on the basis of RT-PCR test on the 21st day (sample taken on the 19th day).

Conclusions: The Integrative Therapy was found effective in curing the COVID-19 patient with above-mentioned co-morbidities. Moreover, a significant improvement in blood sugar levels (not under control with modern medicine) was also achieved. Integrative Therapy based on classical texts of Ayurveda and Yoga may offer a promising and scalable treatment option for COVID-19 patients. A suitably designed randomized controlled trial is needed to assess its efficacy.

Keywords— SARS-Cov-2, COVID-19, Ayurveda, Yoga, Integrative Therapy

1 Introduction

The COVID-19 pandemic has wreaked havoc on every aspect of the human life on planet earth. As on August 28, 2020, more than 24.4 million cases of COVID-19 have been reported in more than 227 countries and territories, resulting in more than 8,31,827 deaths [114]. Although there are several clinical trials under progress, no cure has yet been found for COVID-19 in the Modern Western Medicine (MWM).

The presence of co-morbidities such as Diabetes Mellitus (DM), Hypertension (HTN), Chronic Obstructive Pulmonary Disease (COPD) or old age leads to poorer clinical outcomes in COVID-19 patients [28, 111, 98, 118], and presents additional challenges in the management of the illness. The mortality rate for hospitalized COVID-19 patients in China has been reported to be 3.1% [28], while amongst these hospitalized patients, for those who have one or more of the nine co-morbidities (DM, HTN, COPD, Cardiovascular disease, Cerebrovascular disease, Hepatitis B infection, Malignancy, Chronic Kidney Disease CKD, Immunodeficiency), the mortality rate has been reported to be 8.8% [28]. In the same cohort, the percentage of patients for whom the illness progresses to a severe stage has been reported to be 16%, whereas for patients with co-morbidities, the corresponding percentage is substantially higher at 32.8%. Although the precise figures may vary with geography, the fact that presence of co-morbidities leads to poor clinical outcomes in COVID-19 patients has been independently confirmed in many studies from different countries [111, 98, 17, 19].

Ayurveda is a system of traditional Indian medicine, which is based on sound therapeutic principles and has a proven history of empirical use [64, 92]. It is one of the world's oldest holistic healing systems. As per Ayurvedic system of medicine,

a healthy person is supposed to have a stable equilibrium (congenial homeostasis) of *Doshas* (*Vata*, *Pitta*, *Kapha* – psycho-biological rhythms), *Agni* (metabolism / digestion), *Dhatu* (body tissues/elements that provide them nourishment) and *Mala* (excreta), and the well being of senses, mind and soul [64]. Every individual has a unique combination of these constituent elements, which is known as the individual's *Prakruti* or unique mind-body constitution (Ashtanga Hridaya, Sharira Sthana, Chapter 3, Verse 83) [110]. When an imbalance occurs in this equilibrium, it is supposed to cause a disease, and the Ayurvedic system of medicine seeks to remove this disbalance, to regain healthy state [64, 92].

The occurrence of disease can be further understood as follows: the above mentioned constituent elements have a propensity to change, influenced by various factors, such as the environment we live in, change in seasons, the food that is consumed, negative experiences, presence of physical toxins, irritants, micro-organism or impurities, unhealthy habits, emotions, etc. These influences distort the natural balance of these elements in an individual, increase *ama* (toxins), contributing to *vikruti* (vitiating of the constituent elements); this imbalance manifests as lack of energy, excess mucous, inflammation, and a wide variety of dysfunction and diseases [99, 64, 92]. By using the Ayurvedic principles, the unique *Prakruti* (constitution) of the individual is assessed, the *vikruti* (vitiating) that has occurred is diagnosed, and a personalized treatment plan is advised accordingly. Thus, the Ayurveda system of medicine is inherently personalized, which treats the patient by considering the individual constitution (*Prakruti*), as well as the causes of the symptoms (*vikruti*).

Classical Ayurveda texts such as *Charaka Samhita* (*Vimana Sthana*, Chapter 3) [92] and *Sushruta Samhita* (*Sutra Sthana*, Chapter 6, Verse 19, 20) [64], contain the description of pandemics and describe them as *Janapadoddhvansa* – Jana-pada (meaning community) + Udhvansa (meaning destruction), literally translating into ‘destruction of communities’. These texts offer specific guidelines with regards to the treatment of diseases that affect people during *Janapadoddhvansa*.

Yoga is yet another ancient wisdom from India, which is an extremely deep science that helps one lead a harmonious life [108]. The classical text *Yoga Vasishta* [3] (Book 6, Chapter 81) describes a healthy person as one who is free from physical disease as well as from erroneous affections of the mind. Yoga deals with the holistic principle of body-mind-soul, which proclaims that a human being can experience five dimensions of gross and subtle existence, called *Pancha kosha* or five sheaths, viz., *Annamaya* (physical body), *Pranamaya* (energy field), *Manomaya* (mental dimension), *Vijnanamaya* (related to intuitive knowledge) and *Anandamaya* (level of bliss) *kosha* (*Taittiriya Upanishad*) [94, 88]. *Prana* (the vital life force that is responsible for all the gross and subtle activities) pervades all these five sheaths, and nourishes and sustains them [88]. Yogic practices are aimed at achieving the proper distribution and circulation of *Prana* within the gross and subtle realms of existence, for holistic well-being.

Ayurveda also describes the concept of *Panchaprana* or *Pancha Vayu* (five manifestations of the vital life force in the human body) (*Ashtanga Hridaya*, *Sutra Sthana*, Chapter 12, Verse 4) [110]. *Panchaprana* govern different areas of the body and different physical, neurological and mental activities. When they are functioning harmoniously, they promote the health and vitality of the body and mind, and elevate one spiritually.

Thus, both Ayurveda and Yoga are powerful sciences that are aimed at the proper modulation of *Prana* in the human being, and when administered together in an integrative manner, these can be extremely effective with regards to restoring health, as well as managing or curing diseases.

In this paper we report presumably the first high-risk case of COVID-19 (with reference to the studies available in peer reviewed open literature), treated successfully using Integrative Therapy comprising Ayurveda and Yoga. Although there have been some case reports (see the Section 2) and theoretical works on the use of Ayurveda or Yoga for COVID-19, the authors are not aware of any published work reporting the successful treatment of high-risk cases of COVID-19 through Ayurveda or Yoga. The present case offers a sufficiently supportive evidence that an Integrative Therapy plan based on Yoga and Ayurveda can be useful in treating even the high-risk cases of COVID-19 with mild to moderate symptoms. With regards to the work ahead, a suitably designed randomized control trial (RCT) would be advisable to further establish its efficacy for high-risk COVID-19 patients.

2 Related Works

There is emerging evidence that Ayurvedic treatment methodologies and herbal medicines may be effective in combating COVID-19. Girijaa and Sivan [23] describe one of the first case reports of a COVID-19 positive patient treated entirely with Ayurveda. Using molecular dynamics simulations, Kumar et al. [51] report that Withaferin-A (Wi-A), Withanone (Wi-N) derived from a common Ayurvedic herb called *Ashwagandha*, may block the entry of SARS-CoV-2 into cells. Several herbs such as *Tulsi* (*Ocimum sanctum*) and *Haldi* (*Curcuma longa* - turmeric) used as Ayurvedic medicines are well-known for their immunomodulatory properties [63, 40, 29, 84, 38]. Ayurvedic treatment has been also found to be effective in other COVID-like illnesses such as influenza [97, 93, 43], chikungunya [7]. Several studies have been conducted to understand the COVID-19 pandemic and the conditions posed by it from the perspective of Ayurveda [77, 46, 68, 22, 76, 101, 60]. Based on these observations and the study of classical Ayurveda texts, several experts have proposed the use of Ayurveda for prophylactic [104, 78, 75, 24, 71, 66, 80, 62, 44, 57, 48, 100, 50, 102] as well as therapeutic use [83, 75, 73, 109, 105, 24, 71, 66, 62, 21, 44, 39, 49, 101, 72, 85] in COVID-19. Some studies have also suggested that lifestyle modifications, such as immunity boosting food, can aid in fighting the current situation [4]. Many studies have come up with suggestions for reforms in policies enabling adoption of Ayurveda in the treatment plan for COVID-19 patients [90, 80, 1, 5]. Government of India, Ministry of AYUSH has issued an advisory comprising Ayurveda-based immunity boosting measures for self-care during COVID-19 crisis [61], and an advisory for general public on use of Ayurveda (and other traditional systems of medicines) as a preventive measure for COVID-19 as well as for managing the symptoms of COVID-19 [47]. The same department also issued guidelines for Ayurveda practitioners [25] and Yoga practitioners [26] for treating COVID-19 patients. Several clinical trials are ongoing for evaluating the efficacy of Ayurveda-based interventions for prophylactic as well as therapeutic use in mild to moderate patients of COVID-19.

Traditional Chinese medicine (TCM), which is based on principles similar to those of Ayurveda, has been extensively used in China for treating COVID-19. The Chinese Government actively promoted the use of TCM for management of COVID-19. As a result, several studies have been published on the use of TCM for COVID-19 [69, 112, 86, 113]. The Chinese doctors now recommend the use of TCM along with the western medicine in treating COVID-19 [42, 95]. According to [117] more than 85 percent of the cases in China have received TCM based treatment. Several randomized clinical trials (RCT) on TCM are presently under different stages of completion. Most of the

reviews on RCTs on the efficacy of TCM for COVID-19 [70, 55, 8, 103, 18] report positive findings (see [107, 35] for reviews on mechanism of action of TCM). Several countries have issued guidelines for the use of traditional medicine for COVID-19. See [116, 2] for a review of such guidelines.

Despite the above studies on TCM, caution has also been advised in the use of TCM for COVID-19. For example, Gray and Belessis [27] state that the use of TCM may cause “more harm than good”. Cyranoski [10] argues that TCM is still an unproven treatment and is being subjected to excessive promotion by certain governments. A review by Pang et al. [74] reported that after comprehensive literature search, they found 26 published clinical controlled trials of TCM for COVID-19, out of which 11 were RCTs with 1301 patients; however, none of the RCTs were placebo-controlled and double-blinded. There was significant variation in the types of patients, interventions and outcomes in different RCTs. Also, for most of the published trials, the protocols had not been registered before case recruitment. Thus, based on the above observations, it may be concluded that TCM may offer a promising option for treating COVID-19, yet suitably designed multi-country RCTs may be needed to assess its efficacy.

Promising results observed in several research studies are suggestive of favourable impact of Yoga on immune function, stress response, mental health and quality of life [15, 54, 36, 67, 82, 52]. The usefulness of nasal irrigation, a yogic practice, in improving symptoms and health status of patients with sinonasal disease has also been observed [106]. A key symptom associated with COVID-19 is the onset of dyspnea between 4th and 10th day of illness [9]. Studies suggest that COVID-19 patients with hypoxia or dyspnea may have a higher risk of mortality or developing severe outcomes [96, 115]. It has been reported that a simple intervention such as prone positioning improves the clinical outcomes in such cases [16, 59]. *Yoga* and *Pranayama* have been found helpful in cases of high-altitude hypoxia [33], and several similar interventions in pulmonary rehabilitation for ARDS/COPD patients [56, 53, 30, 20, 12, 81, 31]. Therefore, it is hypothesized that *Yoga* and *Pranayama* can be of help in maintaining the oxygen saturation at safe levels in COVID-19 patients. Owing to its role in stress reduction and immune modulation, Yoga has been proposed as a complimentary therapy in the management of an infectious condition like COVID-19 [65]. Bushell et.al. [6] suggest Yoga practices and meditation as a potential adjunctive treatment for COVID-19. In light of the above observations, the present Integrative Therapy plan was designed, which comprises elements of *Yoga* and *Ayurveda*, along with dietary recommendations and lifestyle modifications, as a treatment option for COVID-19. It is hypothesized that the Integrative Therapy based on Ayurveda and Yoga would be effective in treating COVID-19 patients.

3 Methods

3.1 Case Report

A Delhi-based 55 year old male (confirmed positive) COVID-19 patient (height:5’3”; weight: approx. 70 Kg) filled in the online registration and consent forms on July 1, 2020 to receive Yoga and Ayurveda based Integrative Therapy via telemedicine. The Ayurveda doctor and the Yoga consultant talked to the patient over phone the same day for taking his medical history and symptoms pertaining to COVID-19, and prescribing Integrative Therapy based treatment.

3.1.1 History of the Present Illness

The patient was asymptomatic three weeks prior to the first consultation for the Integrative Therapy. Later, he started developing symptoms of pneumonia, following which he was admitted to the hospital and underwent the RT-PCR test. The patient was detected positive on June 24, 2020. Subsequently, he was prescribed the following allopathic medication for 10 days - Nizonide 500mg (Nitazoxanide 500 mg), Doxy 100mg (Doxycycline 100mg), PAN 40mg (Pantoprazole 40mg), Vitamin C, Matilda-ER (Methylcobalamin, Pyridoxine and Folic acid), LCZ 5mg (Levocetirizine 5mg). On July 1, 2020, at the time of the first consultation for the Integrative Therapy, the patient was home quarantined.

3.1.2 Complaints due to Present Illness

Resolved prior to the first consultation

The patient had fever for about 10 days until June 22, 2020, after which he never had fever again. He also reported to have had dry cough and body-ache earlier, both of which no longer persisted at the time of his first consultation.

Existing at the time of the first consultation

The patient reported to be experiencing occasional obstruction in the throat while speaking for a substantial duration of time. He also felt weak due to which he sounded very low and lacking in energy. According to the patient's description, he used to get exhausted even on doing his own daily chores. The patient had heaviness in the abdomen (gastric upset) and often experienced a bloating feeling. Also, the patient had been having feelings of bad smell and taste, which occurred less frequently then as compared to earlier. The patient's appetite was reduced.

3.1.3 Other Existing Illnesses/Comorbidities

The patient was found to have the following comorbidities at the time of the first consultation. He had Diabetes Mellitus - Type II for the past 10 years and had been on allopathic medication (Glimepiride-2mg, Galvas-50mg, Vobit-0.3mg) for the same. However, despite regular use of the prescribed medicine, the illness was not very well controlled with the Fasting Blood Sugar mostly remaining more than 200 mg/dl and Post Parential Blood Sugar more than 250 mg/dl, as well as renal dysfunction (as evident in his reports dated June 23, 2020). The patient was also found to be hypertensive for the past 20 years, and had been on allopathic medication (Torcilin-10); hypertension was under control with the medication. Hypothyroidism - since 22 years; taking allopathic medication (Thyroxin 75 mcg) and under control.

3.1.4 History of Past Illnesses

The patient had undergone Cholecystectomy (removal of gall bladder) 20 years ago.

3.2 Ayurvedic Interpretation of the Patient's Condition

3.2.1 Diagnosis

Based on the above history and discussion with the Ayurvedic Doctor and Yoga Consultant, it was understood that the patient had past medical history of Type II Di-

abetes Mellitus (not well controlled), Hypertension, Hypothyroidism and CKD. The present illness started with fever, dry cough, weakness, and breathlessness, that led to his hospitalization, followed by diagnosis of pneumonia and positive test for COVID-19. At the time of starting the present integrative treatment, the fever of the patient had been completely resolved, but he was still suffering from difficulty in speech, weakness, feeling of bad smell and taste, heaviness in abdomen (gas formation, distended abdomen), uneasiness in the body, and less appetite. The diagnosis of the patient's illness included COVID-19 positive, with Type II Diabetes Mellitus, Hypertension, Hypothyroidism and CKD.

3.2.2 Pathophysiology

As per Ayurvedic principles, since *jwara* (fever), *shvasa* (respiratory distress) and *kasa* (cough) are the three major symptoms of this *roga* (disease), hence the *roga marga* (pathway of disease) of this *roga* can be considered to be *Abhyantara* (internal origin) [23]. Since there is respiratory distress, along with other symptoms, hence there is *Pranavaha Sroto Dushti* (obstruction of the *Pranavaha Srotas*, i.e. the subtle micro-channels in the body that are the pathways for the vital life force); also, one of the primary seat of this disease is *Uras* (chest region) [23]. Based on these observations, this disease can be characterized as *Agantuja Sannipataja Jwara*, wherein *Vata-Kapha doshas* are primarily vitiated [23].

In *Agantuja Sannipataja Jwara*, *Agantuja* implies *Agantu* (external), i.e. caused by *Bhoota Abhishanga* (external causative factors like virus); this in turn causes the vitiation of all the three *Doshas*, i.e. *Vata*, *Pitta* and *Kapha* [23]. Because of the vitiation of all the three *Doshas*, the term *Sannipataja* is used [23]. As per Ayurvedic principles, the treatment of such a *Jwara* is similar to that of *Nija Jwara*, i.e., the one caused by vitiation of *Doshas* [23].

3.2.3 Etiology

As per Ayurvedic principles, this disease can be correlated with *Agantuja Sannipataja Jwara*, wherein *Vata-Kapha* are primarily vitiated [23]. Furthermore, this is an extremely contagious disease, caused by *Bhoota Abhishanga* (external causative factors like virus), that is characterized in Ayurvedic texts as a *Janapadoddhvansa* disease [23, 64, 92]. Classical Ayurvedic texts like *Charaka Samhita* (*Vimana Sthana* - Chapter 3) [92] and *Sushruta Samhita* (*Sutra Sthana* - Chapter 6 - Verse 19,20) [64] contain the description of similar pandemics, and describe them as *Janapadoddhvansa* – *Janapada* meaning community + *Uddhvansa* meaning destruction - literally translating into destruction of communities. The symptoms of illness during *Janapadoddhvansa*, as mentioned in classical texts, include cough, dyspnoea, asthma, vomiting, nasal catarrh (common cold), headache, fever, etc. [64]. These texts also offer specific guidelines with regards to the treatment of diseases that affect people during *Janapadoddhvansa*, which include Ayurvedic medicines, spiritual practices, etc. [92, 64].

3.3 Therapeutic Intervention

This section presents the detailed treatment plan along with justification for the same, as well as the details of the subsequent compliance of the patient.

3.3.1 Treatment Plan

The following Ayurvedic medicines were prescribed: *Giloy Ghanvati* (3 doses of 2 tablets each to be taken after meal with lukewarm water), *Ashwagandha vati* (2 doses of 2 tablets each to be taken after meal), *Pathyadi Kwath - pravahi* (15 ml mixed with an equal quantity of lukewarm water to be consumed twice a day 30 minutes after meal), and *Diabecon* (2 doses of 1 tablet each to be taken 30 minutes before meal).

The Yoga protocol designed for the patient comprised *Sukshma Vyayama* (subtle joint movements for upper and lower body parts), breathing exercises (4 exercises with 5 iterations in each), *asanas* (*Parshva Sukhasana*, *Sukhasana* twist, *Utthana Mandukasana*, *Ardha Ushtrasana*, *Meru Vakrasana*, *Ardha Halasana* – with one leg folded, *Anantasana*, *Pawanuktasana*), *Shavasana*, *Pranayama* (Sectional breathing and full Yogic breathing, *Anulom-Vilom*, *Bhramari*, *Udgeet*), and *Dhyana* (Mindful breathing). Online guided sessions were given for the first 14 days, thereafter a recorded video of the protocol (with verbal instructions and demonstration) was provided for the patient to be able to practise independently. Looking at the anxiety level of the patient, he was also suggested to practise *Yoga Nidra* [89] (guided Yogic sleep and relaxation practice), for which he was provided a link to guided audio instructions for *Yoga Nidra* (in Hindi language) by Swami Satyananda Saraswati; the duration of the practice being 42 minutes.

The patient was also recommended the following dietary and lifestyle modifications - beginning the day with *Usha paan*, i.e., drinking 2-3 glasses of lukewarm water, dietary intake of green vegetables, fruits, sprouts, barley, ragi flour, wheat porridge, *sahajan* (drumstick), roasted gram, *methi* (fenugreek), turmeric milk and dry fruits was suggested. Also, he was advised to refrain from cold, sour, fried, spicy or other food items that are heavy to digest; these included food items like curd, cold drinks, ice-creams, chilled water, any refrigerated food items, black gram pulse (or any food item prepared with black gram), jackfruit etc. Besides the above dietary recommendations, the patient was encouraged to undertake spiritual practices such as meditation and chanting as per his liking and convenience, for which he was provided a link to the suggested spiritual practices [14].

3.3.2 Justification for Ayurvedic Medicines

Table 1 lists the detailed composition of the prescribed Ayurvedic medicines along with the botanical names of their ingredients. We next provide the justification for prescribing these medicines, based on the classical Ayurveda texts.

Common Name	Botanical Name
Giloy Ghanvati	
Giloy	Tinospora cordifolia
Ashwagandha vati	
Ashwagandha	Withania somnifera
Pathyadi Kwath (pravahi) [87]	
Harad	Terminalia chebula
Baheda	Terminalia bellerica
Amla	Emblica officinalis
Neem chhal	Azadirachta indica
Giloy	Tinospora cordifolia
Haldi	Curcuma longa
Diabecon [32]	
Shilajeet	Asphaltum punjabinum
Meshashringi/Gudmara/Madhunashini	Gymnema sylvestre
Peetashala/Vijaysar/Indian Kino Tree	Pterocarpus marsupium
Turmeric	
Haldi	Curcuma longa

Table 1: Composition of Ayurvedic medicines

Giloy is known to have the following properties [91]: *Tridosha shamaka* (pacifies all the three *doshas*, i.e. *Vata*, *Pitta*, *Kapha*), *Deepan Pachan* (*Rasa Dhatu*, after proper metabolism, converts to the next *Dhatu*, i.e. *Rakta* or blood; undigested part of *Rasa Dhatu* acts as toxin, which is called *Ama Dosha*; this toxin is responsible for the blockage of micro-channels, i.e. *srotas*, leading to diseases; the *Deepan Pachan* property provides for enhancement of digestive fire for digestion of the *Ama Dosha*, thereby freeing the body of toxins), *Jwaraghna* (antipyretic), *Pramehahara* (anti-diabetic), *Hrid-daurbalya nashak* (useful in the treatment of heart problems), *Yakrit vikar nashak* (useful in the treatment of liver related problems), *Kasa roga nashak* (useful in the treatment of cough related problems), *Raktashodhaka* (blood purifier), and *Rasayan* (rejuvenating and removes weakness). Thus, these properties of *Giloy* (which is the sole ingredient of *Giloy Ghanvati*) justify its use in the management of various symptoms of COVID-19.

Ashwagandha has the following properties [91]: *Kapha, Vata shamak* (pacifies *Kapha* and *Vata doshas*), *Balya* (provides strength), *Vringhan* (nourishing effect), *Rasayan* (rejuvenating and removes weakness), *Deepan* (appetizer; and enhancer of the digestive fire), *Anuloman* (carminative, i.e., removes blockage in the gastro-intestinal tract resulting in easy passage of *Vata* such as flatus), *Shwasahara* (helpful in cases of breathlessness or dyspnea), and *mootral* (diuretic, i.e., helpful in kidney related problems). These properties justify the use of *Ashwagandha vati* for the presented case.

The propeties of the ingredients of *Pathyadi Kwath* are as follows [87].

- *Harad* has the properties of [91]: *Tridosha shamaka* (pacifier of all the three *doshas*, i.e. *Vata*, *Pitta*, *Kapha*; especially useful in *Vata* disorders), *Balya* (strength providing), *Medhya* (nervine tonic), *Deepan Pachan* (enhances the digestive fire for digestion of the *Ama Dosha*, as described above), *Yakrit uttejak* (increases liver efficiency), *Jwaraghna* (antipyretic), *Mootral* (diuretic, i.e., useful in kidney related problems), *Anuloman* (carminative, i.e., removes blockage in the gastro-intestinal tract resulting in easy passage of *Vata* such as flatus) and *Mridu-rechan* (mild purgative).
- *Baheda* possesses the following properties [91]: *Tridosahara* (pacifies all the three *doshas*, i.e. *Vata*, *Pitta*, *Kapha*, and is especially useful in *Kapha* disorders), *Jwaraghna* (antipyretic), *Kasa roga nashak* (treats cough related problems), *Shwas roga nashak* (helps in breathlessness, dyspnea), *Swarabheda nashak* (helps eliminate hoarseness of voice), *Pratishyaya nashak* (useful in common cold), *Dhatuwardhak*, (nourishes body tissues, especially *Rasa* - lymph, plasma, etc., *Rakta* or blood, *Mansa* or muscles, *Meda* or fat and *Dhatu*s), *Deepan* (appetizer; and enhancer of the digestive fire), and *Anuloman* (carminative, i.e., removes blockage in the gastro-intestinal tract resulting in easy passage of *Vata* such as flatus).
- *Amla* has the following properties [91]: *Tridosahara* (pacifies all the three *doshas*, i.e. *Vata*, *Pitta*, *Kapha*; especially useful in *Kapha* disorders), *Deepan* (appetizer; and enhancer of the digestive fire), *Anuloman* (carminative, i.e., removes blockage in the gastro-intestinal tract resulting in easy passage of *Vata* such as flatus), *Rochan* (removes anorexia, i.e., unwillingness to eat and reduced appetite), *Rasayan* (removes weakness and is rejuvenating), *Balya* (strength providing), *Medhya* (nervine tonic), *Mootral* (diuretic), *Jwaraghna* (antipyretic), *Pramehaghna* (used to treat *Madhumeha* or diabetes), *Yakrit uttejak* (enhances liver efficiency), *Kasa roga nashak* (treats cough related problems), *Shwas roga nashak* (useful in breathlessness, dyspnea) and *Hrid-roga nashak* (used to treat heart problems).
- *Neem chhal* is known to have the following properties [91]: *Kapha*, *Pitta shamak* (pacifies *Kapha* and *Pitta Doshas*), *Rochan* (removes anorexia, i.e., unwillingness to eat or reduced appetite), *Yakrit uttejak* (enhances liver efficiency), *Rakta shodhak* (blood purifier), *Prameha nashak* (used to treat *Madhumeha*, i.e., diabetes), *Ama pachak* (digests the *Ama Dosha*, i.e. the toxins in the body, as described above under *Giloy*), *Jwaraghna* (antipyretic), *Kasa roga nashak* (used to treat cough related problems), and *Dhatukshaya* (prevents depletion of *Dhatu*s).
- The properties of *Haldi* are as follows: *Kapha*, *Vata shamak* (pacifies *Kapha* and *Vata Doshas*), *Pitta rechak* (removes vitiated *Pitta Dosha*), extremely useful for *Prameha* (useful in disorders like diabetes), *Ama pachak* (digests the *Ama Dosha*, i.e. the toxins in the body, as described above under *Giloy*), *Jwaraghna* (antipyretic), *Kasa roga nashak* (used to treat cough related problems), *Shwas roga nashak* (useful in breathlessness, dyspnea), *Anuloman* (carminative, i.e., removes blockage in the gastro-intestinal tract, resulting in easy passage of *Vata* such as flatus), and *Rochak* (removes anorexia, i.e., unwillingness to eat or reduced appetite),
- The properties of *Giloy*, another ingredient of *Pathyadi Kwath*, have been mentioned above under *Giloy Ghanvati*.

Thus, the above ingredients of *Pathyadi Kwath* were expected to help the patient with the gastric issues he had been experiencing, resolve the bad taste and loss of appetite, enhance his digestion and rejuvenate him, remove weakness, as well as help in other symptoms of the disease.

The ingredients of the tablet *Diabecon* [32] have been discussed below. This was prescribed to address the not-well-controlled blood glucose levels of the patient.

- *Shilajeet* is known to possess the following properties [32, 41]: *Vata*, *Pitta hara* (pacifies *Vata* and *Pitta* Doshas), *Rasayan* (rejuvenates and removes weakness), *Ama pachak* (digests the *Ama Dosha*, i.e. the toxins in the body, as described above under Giloy), *Kapha rog nashak* (useful in *Kapha* related disorders), *Mootra roga nashak* (useful in urine related problems), useful in *Prameha* (useful in disorders like diabetes), *Kasa roga nashak* (used to treat cough related problems), and *Shwas roga nashak* (useful in breathlessness, dyspnea). It is also known to reduce hepatic glucose production, prevent hyperglycemia, protect β -cells of pancreas, and promote unrestricted endogenous insulin action [32].
- *Meshashringi/Gudmara/Madhunashini* has the following properties [32, 41]: *Kapha*, *Vata shamak* (pacifies *Kapha* and *Vata* Doshas), especially useful in *Madhumeha* (diabetes) - works by increasing the secretion of insulin and reducing the blood sugar level, *Mootral* (diuretic, useful in kidney related problems), *Madhurya nashak* (removes the sweet taste of the tongue), *Deepan* (appetizer, enhances the digestive fire), *Yakrit uttejak* (enhances liver efficiency), *Pratishyaya nashak* (useful in common cold), *Kasa roga nashak* (used to treat cough related problems), and *Shwas roga nashak* (useful in breathlessness, dyspnea). The main constituent of *Meshashringi* is gymnemic acid that has anti-diabetic properties and reduces excess blood sugar; it also has a regenerative effect on the β cells of pancreas and is insulinotropic, i.e. stimulates insulin's production and activity; it temporarily decreases sugar craving by removing the taste for sugar and enhances the activity of enzymes that are responsible for the absorption and utilization of glucose [32].
- *Peetashala/Vijaysar/Indian Kino Tree* has the properties of [32, 41]: *Kapha*, *Pitta shamak* (pacifies *Kapha* and *Pitta* Doshas), *Madhumeha hara* (useful in diabetes), *Rasayan* (rejuvenates and removes weakness), *Rakta shodhak* (blood purifier). It has the property of inhibiting α -glucosidase; it regularizes primary metabolic enzymes that are involved in carbohydrate metabolism [32].

The patient was also advised to consume turmeric milk, given the beneficial properties of *haldi* (given above).

3.3.3 Justification for Yoga Protocol

The *Yoga* component of the Integrative Therapy was designed to achieve maximum benefits considering the co-morbidities, COVID-19 symptoms and anxiety. The protocol began with *Sukshma Vyayama* (micro/subtle joints movements) that are preparatory practices to relieve joint stiffness and muscle tension, and also bring about relaxation. This was followed by *breathing techniques*, which improve the lung function, address weakness and reduce anxiety. Next in the protocol were *Yogasanas* (*yogic* postures) selectively picked to improve lung capacity and flexibility, enhance blood circulation, and bring about a deep sense of calmness. Postures involving intense

backward bend were deliberately avoided since the patient has umbilical hernia. Following the *asanas* were *relaxation techniques* that counter stress response in the body. Stress raises blood glucose levels, suppresses the immune system, and increases blood pressure; relaxation techniques, such as Quick Relaxation Technique (QRT) [13], Deep Relaxation Technique (DRT) [13] and *Yoga Nidra* [89] are some powerful tools that reduce stress and anxiety. Given the anxiety and stress that the patient was undergoing, relaxation techniques were expected to bring about overall healing. The *yoga* sessions always concluded with *Pranayama* and Mindfulness meditation, which are known to reduce anxiety and improve lung function.

3.3.4 Compliance

Given below in Table 2 are the compliance details of the patient:

Day	Intervention				
	Giloy Ghanvati	Ashwagandha vati	Pathyadi Kadha	Diabecon	Yoga+ Pranayama
1	✓	✓	✓	✓	✓
2	✓	✓	✓	✓	✓
3	✓	✓	✓	✓	✓
4	✓	✓	✓	✓	✓
5	✓	✓	✓	✓	✓
6	✓	✓	✓	✓	✓
7	✓	✓	✓	✓	✓
8	✓	✓	✓	✓	✓
9	✓	✓	✓	✓	✓
10	✓	✓	✓	✓	✓
11	✓	✓	✓	✓	✓
12	✓	✓	✓	✓	✓
13	✓	✓	✓	✓	✗
14	✓	✓	✓	✓	✓
15	✓	✓	✓	✓	✓
16	✓	✓	✓	✓	✓
17	✓	✓	✓	✓	✗
18	✓	✓	✓	✓	✓
19	✓	✓	✓	✓	✓
20	✓	✓	✓	✓	✓
21	✓	✓	✓	✓	✓

Table 2: Compliance Chart

4 Results

The first consultation of the patient was done on the seventh day after the confirmation of COVID-19 through the RT-PCR test. He was under home-isolation during the entire course of treatment. All the symptoms reported by him were resolved by the ninth day after starting the treatment. However, since the report of the second RT-PCR test received on the 8th day of the treatment was positive, the intervention

was continued (w.e.f. July 7, 2020) with slight modifications as reported in Section 4.1. The third RT-PCR report received on the 15th day of the treatment (sample given on the 13th day) was not conclusive, following which another test was done, whose report received on the 21st day of the treatment (sample given on the 19th day) showed no infection. Moreover, the patient's uncontrolled blood sugar level showed significant improvement, with FBS being 90 mg/dl and PPBS being 140 mg/dl. Most importantly, the patient was in a much better state of mind (as evident through his feedback during consultations) and sounded much more confident by the end of the treatment.

4.1 Timeline of COVID-19 Symptoms and Treatment

A detailed description of the progress made by the patient and the medicines given during the course of the treatment is given below in Table 3.

Day	Date	FBS (mg/dl)	PPBS (mg/dl)	Random	Follow-up details
0	1/7/2020	-	-	-	Generally the blood sugar values were like this - FBS > 200 mg/dl, PPBS > 250 mg/dl, while the patient had been taking allopathic medication for the same; PPBS was reported to be 230 mg/dl on 30/6/2020.
1	2/7/2020	192	-	-	Symptoms reported/observed: Difficulty in speech, weakness, sometimes feeling of bad smell and taste, heaviness in abdomen (due to gas formation), uneasiness in body, less appetite.
2	3/7/2020	169	-	-	Improvement observed; approximately 25% relief reported in all the symptoms; lightness in the body reported.
3	4/7/2020	190	206	-	Doing Yoga (twice daily); feeling good, with improvement in all the symptoms.
4	5/7/2020	160	206	-	Approximately 50% relief reported in all the symptoms; lightness in the body reported.
5	6/7/2020	155	175	-	No weakness; normal appetite; taste and smell almost normal; approximately 75% relief reported.
6	7/7/2020	140	-	110	No sore throat; no weakness; normal taste and smell; almost no other problem except mild heaviness in abdomen; approximately 80% relief reported.
7	8/7/2020	140	-	110	No problem except mild heaviness in abdomen.
8	9/7/2020	130	230	-	Second RT-PCR report received on 8/07/2020 was +ve; slight change done in the prescription: i) Diabecon - 1 tab. in the morning and 2 tab. in the evening (earlier it was 1 tab. in the evening) ii) advised to take (ajwain + saunf + dhaniya) powder - 1/2 spoon, with lukewarm water, after meal.
9	10/7/2020	110	150	-	Improvement in all the problems (including heaviness in abdomen)

10	11/7/2020	110	150	-	No problem except mild heaviness in abdomen; dose of Diabecon changed to 2 tab. BD (patient advised to start the revised dose from 12/7/2020).
11	12/7/2020	130	140	-	No problem except mild heaviness in abdomen; started Diabecon 2 tab. BD.
12	13/7/2020	99	112	-	No problem except mild heaviness in abdomen.
13	14/7/2020	108	112	-	Sample given for RT-PCR test; no problem except mild heaviness in abdomen.
14	15/7/2020	120	165	-	No problem except mild heaviness in abdomen.
15	16/7/2020	108	140	-	RT-PCR test inconclusive as per the report; no problem except mild heaviness in abdomen.
16	17/7/2020	90	140	-	No problem except mild heaviness in abdomen.
17	18/7/2020				No problem except mild heaviness in abdomen.
18	19/7/2020				No problem except mild heaviness in abdomen.
19	20/7/2020				Sample given for RT-PCR test; the patient's allopathic doctor reduced the dosage of his diabetes medication, i.e. Glimepiride changed from 2 mg to 1 mg; no problem except mild heaviness in abdomen.
20	21/7/2020				Diabecon changed to Diabecon DS 1 tab. BD; no problem except mild heaviness in abdomen.
21	22/7/2020				RT-PCR reported no infection (negative) ; no problem except mild heaviness in abdomen.

Table 3: Progress of the patient and evolution of the treatment plan

4.2 Followup

Follow-up was done till August 01, 2020. The patient continued to report mild heaviness in the abdomen till July 26, 2020. Thereafter (w.e.f. July 27, 2020), he reported complete relief and rejuvenation. Besides the symptoms that appeared after being infected with the coronavirus, it was observed that the other ailments which the patient had a history of were also positively impacted. Table 4 summarizes the improvements observed in the reports of the patient received on August 14, 2020, as compared to those received on June 23, 2020; significant improvement can be seen in the values of HbA1c and Renal profile parameters.

	June 23, 2020	August 14, 2020	Reference Range
Blood Sugar			
Glycosylated Hb (HbA1c)	9.2%	6.6%	< 6.5%
Renal Profile			
Blood Urea Nitrogen (BUN) - Kinetic UV Test (Urease, GLDH)	30.4mg/dl	11.2 mg/dl	7.94 mg/dl – 20.09 mg/dl
Creatinine - Kinetic Color Test	1.83 mg/dl	0.75 mg/dl	0.67 mg/dl – 1.17 mg/dl

Table 4: Follow-up details

4.3 Patient’s Perspective on the Treatment

After recovery (dissolution of symptoms and negative RT-PCR report), a subjective feedback was taken from the patient to understand his perspective on the intervention. The patient expressed immense satisfaction and a sense of confidence. He was amazed and delighted to find that besides aiding in a speedy recovery from the symptoms of COVID-19, including weakness, anxiety and depression, Yoga and Ayurveda had managed to control his blood sugar level as well. The normal sugar levels observed by the end of the treatment were astounding given that regular allopathic medication could not achieve this. The patient was so convinced about the efficacy of Yoga and Ayurveda that he suggested his spouse (who was also tested positive for COVID-19 and had been pursuing only allopathic medication) to seek Ayurvedic consultation. Most importantly, he is determined to adopt Yoga in his lifestyle.

5 An Accidental Control

Coincidentally, a control case was found in the patient’s family - his spouse, a 47 year old female who was tested positive for COVID-19 on the same date as the patient himself (June 24, 2020). She remained on allopathic medication ever since. On July 21, 2020, while our patient’s report suggested that he was free from the infection, his spouse was still tested positive. It is worth emphasizing that while our patient had multiple comorbidities, his spouse had none. Even as late as July 10, 2020, she complained of symptoms like sputum (mild), sore throat (mild), bodyache, muscle cramps, weakness (mild), lower backache, disturbed sleep, anxiety with nervousness. On our patient’s suggestion, she took Ayurvedic consultation and was advised medication on July 11, 2020. However, she was reluctant to take these medicines until July 22, 2020, when her COVID-19 test (RT-PCR) continued to report infection while our patient was reported free from infection. Finally, she started pursuing the prescribed Ayurvedic medicines on July 24, 2020, following which she was reported negative on July 31, 2020 in COVID-19 test (RT-PCR).

6 Discussion and Conclusions

Besides the variety and severity of physiological symptoms posed by COVID-19, it deeply affects the patients psychologically as well [34, 58]. Owing to the highly contagious nature of coronavirus, the social stigma associated with the disease and the involved isolation period have deep adverse impact on the already nervous patients [79]. This stress and anxiety may tend to further weaken the already compromised immune system, thereby potentially creating a vicious cycle. The patient treated in the presented case was undergoing a similar situation at the time of the first consultation. With his symptoms prevailing for long, and two more of his family members being infected (one of them being hospitalized), the patient was in severe distress and exhibited anxiety. The Integrative Therapy administered to him not only helped manage his physiological symptoms, but also helped control his anxiety and stress (see e.g., [45, 11] for reviews on Yoga for Anxiety). Within a week, an observable change in his confidence level was seen, and he appeared much more calm and peaceful. This change may be attributed to his regularity in attending the Yoga sessions, besides the relief experienced by subsiding of COVID-19 symptoms. The authors believe that apart from boosting immunity, Yoga and *Pranayama* practices immensely contributed to his overall healing by inducing a relaxation response [37] in the body. The success of the Integrative Therapy in this high-risk case of COVID-19 is evident in that the patient was not only cured of COVID-19, but a sense of overall well-being was bestowed on him.

This successfully treated case certainly calls for more well-designed studies on the proposed Integrative Therapy approach, possibly leading to its adoption in the standard treatment being provided to COVID-19 patients.

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