



Original Research Article (Clinical)

A randomized open label parallel group pilot study to evaluate efficacy of Ayurveda interventions in the management of asymptomatic and mild COVID-19 patients-experiences of a Lucknow based level 2 hospital of Uttar Pradesh, India



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ABSTRACT

Background: SARS-CoV-2 has emerged as a global threat since its onset in December 2019. India has also been severely affected by the dreadful Corona Virus and is currently battling one of the worst pandemics of history. WHO and the world medical fraternity are putting their efforts to materialize a treatment or vaccine for this novel virus. A randomized open label parallel group study was designed in a Lucknow based level 2 COVID hospital to evaluate the efficacy of Ayurvedic interventions in the management of asymptomatic and mild COVID 19 patients.

Objective: To evaluate the efficacy of Ayurveda in the management of mildly affected COVID-19 patients.

Materials and methods: The current trial was an open label randomized 10-day study. Total 120 asymptomatic and/or mild COVID-19 positive patients fulfilling inclusion criteria were randomly grouped into three. RT-PCR of all the patients were done on 5th, 7th and on 10th day respectively. The observations were noted and results were analyzed statistically. Kruskal–Wallis test and Wilcoxon Sign rank test were used for data analysis where applicable.

Results: Improvement in symptoms, enhancement in Agni and recovery from COVID infection was observed. The results obtained were encouraging and showed better viral clearance and control of symptom progression in the patients placed on Ayurvedic medications.

Conclusion: The promising results in the study showed that an approach involving Ayurveda can be helpful for the management of the mild COVID-19 patients. Ayurveda can be used to limit community spread and check disease progression to a more appalling state.

Trial registration: Trial was registered with Clinical Trials Registry- India (CTRI registration number: CTRI/2020/06/025800).

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1. Introduction

SARS-COV-2 has emerged as a new health threat for the entire world as virus has spread to almost every single country. Having its root in Wuhan, in China, it has quickly spread far and wide, posing new challenges in front of whole medical fraternity, which is still in search of devising a vaccine or suitable medicine.

The current pandemic was declared a public health emergency of International concern on 30th January 2020 and a pandemic on 11th March, 2020 by WHO [1]. As of now, more than 41 million cases of COVID-19 have been reported resulting in more than 1.1 million, worldwide [2]. In some countries, even a second wave of the virus is being speculated.

The novel corona virus is primarily spread between people during close contact, most often via small droplets produced by coughing, sneezing, and talking. Less commonly, people may get infected by touching a contaminated surface. Speech generated droplets may remain airborne for tens of minutes. It is most contagious during the first three days after the onset of symptoms, although spread is possible before symptoms appear and also from people who do not show symptoms [3].

Common symptoms include fever, dry cough, fatigue, shortness of breath, anosmia and tastelessness [4,5]. Complications may include pneumonia and acute respiratory distress syndrome. The time from exposure to onset of symptoms is typically around five days but may range from two to fourteen days [6].

The pandemic has caused global social and economic disruption worldwide including the largest global recession since the great depression [7]. It has led to cancellation or postponement of sporting, religious, political, and cultural events, widespread supply shortages exacerbated by panic buying [8].

WHO has set two main goals to contain effects of COVID-19 to a minimum [9]. First is to prioritize and accelerate innovative research to help to contain the spread of the epidemic and facilitate care for those affected. The second objective is to learn from current global pandemic's response to prepare better for next unforeseen epidemic.

Emphasis has also been laid on early detection of cases through contact tracing and high testing as many asymptomatic cases go unnoticed which act as a reservoir of infection. Early diagnosis is therefore important to contain spread and limit the community spread.

The guidelines by the Health ministry for social distancing and proper hygiene and sanitary methods implementation are already in place for the public as preventive measures. More stringent measures at treatment centers for the management of active COVID patients are still in progress.

At this point when the world needs a major breakthrough for an appropriate line of management, it needs to be seen whether any significant leads can be procured through the intervention of Ayurveda. Ministry of AYUSH in India has propagated use of traditional Indian systems of medicine including Ayurveda for prophylactic use as well as an alternative system of medicine to provide an effective and holistic approach towards COVID management.

On the basis of clinical presentation, the disease resembles *sannipataja jwara*, one of the types of fever mentioned [10]. Besides, it also bears an analogy with *Rajayakshma (shosha)* [11] and *dushta pratishyaya* [12] due to *agnimandya*. The overall effect of corona virus infection manifests in the form of impaired digestion and hampered immune activities (*Oja kshaya*). The patients with an associated comorbidity may present with gradual deterioration with difficulty in breathing and eventually this may lead to death.

The primary objective of this study was to evaluate the efficacy of Ayurvedic medicines in COVID-19, to analyze these results and compare it with the active control group. The study also aimed at

the assessment of the progression of disease in active COVID-19 patients through this intervention. In this study, an Ayurvedic management on the lines to reinstate digestion and eventually augment bodies' immunity was planned. Besides, the drugs selected for the study also had proven effects on the upper respiratory tract function enhancement. As per Ayurveda classics, all the diseases have said to be originated due to *mandagni* [13] (~Weak digestive aptitude) thereby leading to insufficient immunity to deal with mildest of the infections, thus leading to onset of disease. The disease chiefly appears to affect the *pranavaha srotasa* (~respiratory tract), *Ojas* (~immunity) and *agni* (~digestive capacity).

2. Materials and methods

Total 120 COVID-19 positive subjects presenting with milder symptoms or no symptoms were included in the study. Patient classification and inclusion was based on the Clinical severity and assessment parameters provided by Ministry of Health and Family welfare, Government of India in their Clinical management Protocol: COVID-19 [14].

2.1. Ethical approval and trial registration

The study on approval from Hospital Institutional ethics committee (IEC) was registered with Clinical trial registry (CTRI/2020/06/025800).

2.2. Trial site

Source of patients was isolation ward of Lokbandhu Rajnarayan Combined Hospital, Lucknow which was upgraded as a Level II COVID 19 management center by Uttar Pradesh Government.

2.3. Study design

The trial was a 10 day randomized, open label, multiple arm interventional study. 120 enrolled patients were randomly distributed in three groups. Two groups were placed on Ayurvedic drug intervention while the third group was Control group.

2.4. Inclusion criteria

Patients aged above 25 years and below 60 years were included in the study. Patients tested positive for COVID 19 virus, asymptomatic or with uncomplicated upper respiratory tract infection, having mild symptoms like fever, cough, sore throat, nasal congestion, malaise and headache were included. Those willing to give informed consent were incorporated in the research work.

2.5. Exclusion criteria

Patients below 25 years and above 60 years of age were excluded from the study. Patients presenting with increased severity of disease or having severe difficulty in breathing and/or those having serious co-morbidities were not included. Patients not willing to give informed consent or unwilling to consume Ayurveda drugs were also excluded from the study.

2.6. Consent

A verbal consent was taken from the patients registered for trial telephonically as patients were in isolation wards and only duty doctors and nursing staff were allowed to stay in there with patients. Written consent was avoided due to a risk of spread of infection.

2.7. Treatment groups

Patients were randomly grouped into Group A, Group B and Group C keeping 40 patients in each group (Table 1).

2.8. Randomization

120 Patients were randomly placed in three groups on the basis of Computer generated randomization.

2.9. Intervention drugs

The interventional raw drugs were procured from a certified Ayurvedic drug dealer, their standard quality was ascertained by Dr. Rajeev Vilas, Associate professor at Department of RSBK, State Ayurvedic College, Lucknow. *Samshamani vati* [15], *Shunthi* and *Pippali* powders were obtained from a GMP certified company. The preparation of the medicine was done as per the norms and standards of Ayurvedic medicine preparation (~*Kwatha kalpana*) [16].

2.10. Preparation of drugs

Vyaghryadi Kashaya [17] (~decoction) was prepared by boiling equal parts (about 17 g of each) of *Kantakari* (*Solanum xanthocarpum* Schrad, & Wendl.), *Shunthi* (*Zingiber officinale* Rosc.) and *Guduchi* (*Tinospora cordifolia* Thruhb.) in 200 mL potable water, reducing to 50 mL and straining through a clean cotton fabric. This 50 mL is a single dose was prescribed to the patient by adding 250 mg of powdered *Pippali* (*Piper longum* L.).

2.11. Advise to patients

Patients were advised to follow a healthy routine of sleeping and awakening early, advised to perform *Pranayama* (breathing exercises) during the period of their stay, which was ensured by the doctors and nurses on duty in the Isolation wards. On discharge too, they were asked to follow isolation at home for seven days, maintain physical distancing, proper hygiene and continue the similar dietary regimen and lifestyle.

2.12. Diet

Patients in all the three groups were placed on a specific diet regimen and advised with proper *pathya* (~things to be done and consumed) and *apathya* (~things to be avoided) during the treatment regimen and afterwards. They were provided diet comprising of green gram and green vegetables along with seasonal fruits like water melon. Food items like curd, potatoes, black gram, cheese and those prepared from *Maida* (~refined flour), which are heavy to digest were not prescribed in their diet regimen. They were advised to take warm water and saline gargling and refrain from cold water. Besides, all the patients were advised to take at least one onion (*Allium cepa* L.) in their diet along with their meals.

Table 1
Grouping of the patients, interventions.

	Number of patients	Trial Drug	Dosage	Duration
Group A	40	<i>Vyaghryadi Kashaya</i>	50 mL twice a day with 250 mg of <i>Pippali</i> powder empty stomach morning and evening.	10 days
Group B	40	<i>Samshamani vati</i> Fine powder of <i>Shunthi</i> (<i>Zingiber officinale</i> Rosc.) Paste of <i>Rasona</i> (<i>Allium sativum</i> L.) <i>kalka</i>	2 tablets 500 mg twice daily 2 gm twice daily with warm water after meals. 1 gm once daily with warm water.	10 days
Group C	40	Tab Vitamin C Tab Paracetamol	500 mg twice a day Dose of 500 mg SOS	10 days

2.13. RT-PCR

Real time PCR which is considered Gold standard for COVID-19 was the investigation of choice in this study. Nasal and throat swab samples were collected on pre-decided days (on 5th, 7th and on 10th day) by pathologists and samples were sent to microbiology unit of King George Medical University, Lucknow for testing.

2.14. Assessment criteria

The positively tested patients were assessed clinically for symptoms after admission in Isolation ward. They were graded using standard Gradation criteria for assessment before and after the study. The symptoms included fever, sore throat, cough, dyspnea, running nose, generalized weakness, headache, irritability, nausea/vomiting, diarrhea, loss of taste and loss of sense of smell on a scale of 0–5 as per the Assessment guidelines of CCRAS, New Delhi [18].

Continuous monitoring of the patients was done for vital parameters like temperature, respiratory rate and blood pressure, pulse rate and oxygen saturation.

The observations were noted and the results obtained were analyzed using Wilcoxon Signed Rank test and Kruskal Wallis' test for data accordingly. The results obtained after study were compared within the group and in between the groups for statistical significance (Table 1).

3. Results

3.1. Demographic data

The patients tested positive for COVID-19 were admitted in the isolation ward of Lokbandhu Hospital with level II facility. Out of 176 assessed patients, 120 were included in the trial after their approval and randomly distributed in three groups. 87 patients were male and 33 were females. 77 patients were in the age group of 25–40 years, 16 were in the age group of 40–50 years while 27 were between 50 and 60 years (Table 2).

3.2. Classification on the basis of symptoms

All the three groups were assessed on the basis of the symptoms present in the patients. 47 patients out of 120 were COVID positive without any symptoms of disease on admission while 73 patients were having mild symptoms of disease. Number of asymptomatic patients in Group A was 14, 15 in Group B and 18 in Group C (Table 3). Their gradation was done before and after the treatment regimen of ten days (Table 4). Patients with severe symptoms or comorbidities like diabetes, COPD, cardiac patients and pregnant women were not included in the study.

Table 2
Demographic data.

Age Group	25–40 years		40–50 years		50–60 years	
	Male	Female	Male	Female	Male	Female
Group A	18	06	06	02	03	05
Group B	22	07	01	01	07	02
Group C	18	06	04	02	08	02
Total	58	19	11	05	18	09

3.3. Effect on symptoms

Least progression of symptoms, average early recovery with earlier viral clearance was seen in Groups A and B in comparison to Group C. Maximum relief in fever, cough, sore throat and irritability was observed in Group A than Groups B and C, which was statistically significant. In few patients of Group C loss of proper taste and smell was more prominent. Group B patients showed improvement in the abnormal sensation of taste and general weakness which was statistically non-significant, though.

3.4. Effect on Real time PCR

An important criteria of assessment in these patients was the RT-PCR test for which the patients were assessed on 5th, 7th and 10th days respectively in all the three groups. Patients were discharged after two consecutive RT-PCR tests for COVID -19 were negative.

In Group A, RT-PCR became negative in 37 out of 40 patients on 5th day. Remaining three tested negative on the 7th day. All the patients were discharged within 10 days of admission in isolation ward (Table 3). The number of negative cases in Group B and C on 5th day were 35 and 23 respectively. All the patients recovered on 7th day in Group A, while 39 recovered in Group B and 27 in Group C. This infers that the time of viral clearance was minimum in Group A followed by Group B, while it was maximum in Group C.

On day 5, percentage of the patients tested negative in group A was 92.5% while that in group B was 87.5% and 57.75% in group C. On day 7, 100% patients in group A and 97.5% in group B tested negative, while the recovered percentage in group C was 72.5%. By 10th day all patients were negative in groups A and B, while 36 were negative in group C (Table 5, Fig. 1).

Overall improvement in the quality of life of the patients, on the basis of their mental and physical states, was observed after their treatment regimen which was more pronounced in the patients of Group A and B because of early recovery and significant decrease in mental stress.

3.5. Complications and their management

One of the patients in Group C was shifted to Level III hospital due to severe difficulty in breathing on 5th day of his admission. Two patients in Group A complained of loose stools with mild weakness after two days of consumption of decoction. The decoction was discontinued and they were managed by administering

Table 3
Classification of patients on the basis of symptoms.

	Asymptomatic	Symptomatic
Group A	14	26
Group B	15	25
Group C	18	22
Total	47	73

Kutaja ghan vati in a dose of 2 tablets 500 mg each, twice daily for two days. Three patients in group B complained of mild burning sensation in abdomen which was easily managed by advising them *Dhanyaka siddha jala* (Coriander water) and *Shatpushpa* (~Fennel seeds) 3 g for consumption before meals.

4. Statistical analysis

Null Hypothesis was the distribution of days at which two consecutive test negative is the same across categories of the group. However, Kruskal–Wallis H test showed that there was a statistically significant difference in the number of days at which two consecutive real time PCR test comes negative and between the three groups ($\chi^2(2) = 23.35, p < 0.001$). Pairwise comparison post hoc test was carried out on each pair of groups. The pairwise comparisons show the results of the test on each couple of groups and found very strong evidence ($p < 0.001$) of a difference between the groups A and C as well as groups B and C.

5. Discussion

The basic concept of disease in Ayurveda has been said to be an imbalance of the Biohumours (~*doshas*) and derangement of digestive fire (~*Mandagni*) which eventually leads to a decreased level of immunity, subsequently making body susceptible to any infectious agent. The basic line of management involves the correction of *Agni* to an optimum level and thus improving immunity.

The manifestation of disease can be compared to *Sannipatika Jwara* especially of *Kaphaja* [19] predominance wherein symptoms like Running nose, Cough, Drowsiness, Loss of Appetite, indigestion, headache are present or *Vataja* [10] predominance wherein symptoms like dyspnea, dry cough, running nose, pain in thoracic region, dryness of Mouth and abnormal sensation of taste and smell are present. On aggravation, symptoms of *Ojakshaya* can be seen which may result in death of the patient. The description of a disease involving a major area of land has been stated as *Janapadodhwamsa* by Charaka and *Nidana vipreeta chikitsa* (~management contrasting to the causative factors) has been advised in such conditions [20]. The choice of drugs adopted here was for management of impaired digestion (*Mandagni* and *Ama pachana*), protection of respiratory system hence improvising the bodies' defense mechanism (Table 6).

As per the classics, there are six stages in a disease progression (~*Shad Kriya kala* [21]). If the progress of the disease is not identified at one stage it progresses to the next more severe stage with more complications. Therefore, to manage disease progression, early identification and management is required or it would be subsequently be more difficult to manage and ultimately the patients' probability of survival narrows out. Especially in a disease like COVID-19, which has a rapid spreading rate and if symptoms worsen it has proven to be fatal worldwide, so there is this need of earlier management for better prognosis.

According to the protocol, patients were to be discharged after their recovery and at least two consecutive reports of negative RTPCRs. This was the time in consideration for viral clearance [18]. It was noted that patients in *Kashaya* group recovered earlier than those on *Shunthi churna* and *Rasona kalka* (group B) followed by the control group. 40 patients reported negative in RT PCR on day 7 in group A.

In group B, 35 patients reported negative on day 5 and 39 on day 7. All 40 patients recovered on day 10. In the control group, 23 reported negative on day 5, 27 on day 7, 36 on day 10 and 39 on day 14.

Table 4
Changes observed in symptoms after Treatment.

Clinical Symptoms	Group A			Group B			Group C		
	BT ^a	AT ^b	P value ^c	BT ^a	AT ^b	P value ^c	BT ^a	AT ^b	P value ^c
Fever	0.45	0	<0.001	0.375	0.025	0.002	0.125	0.025	0.046
Sore throat	0.975	0.05	<0.001	0.4	0.1	0.003	0.3	0.15	0.014
Cough	0.775	0.05	<0.001	0.375	0.05	<0.001	0.425	0.3	0.025
Dyspnea (difficulty in breathing)	0.15	0	0.034	0.225	0.075	0.014	0	0	1.000
Running Nose	0.225	0	0.007	0.3	0.13	0.052	0.1	0.03	0.083
General weakness	0.325	0.2	0.025	0.275	0.075	0.25	0.011	0.15	0.046
Headache	0.075	0	0.083	0	0	1.0	0.08	0.05	0.317
Irritability	0.31	0	0.001	0.475	0.1	0.001	0.25	0.175	0.083
Nausea/vomiting	0	0	1	0.15	0.075	0	0.063	0	0.063
Diarrhea	0	0	1	0	0	1	0	0	1
Loss of Taste	0.35	0.1	0.023	0.225	0.05	0.02	0.08	0.1	0.705
Loss of Smell	0.25	0.025	0.007	0.1	0.05	0.157	0.18	0.125	0.317

^a BT before treatment.
^b AT After treatment.
^c Wilcoxon Signed Rank test.

The rationale for selection of this intervention was comparison of Ayurvedic drugs with the control group. Two Ayurvedic study groups were included to compare the effect of drugs acting only on Agni with the drugs acting on Agni as well as Pranavaha srotasa.

Patients in Kashaya group (A) and Churna group (B) presented with improved appetite, feeling of wellness and lightness with better bowel evacuation. The Kashaya group patients also reported better throat clearance on completion of regimen of ten days.

Vyaghryadi kashaya is indicated for Sannipatik jwara by Vagbhata [17]. Owing to the presence of Kantakari, Guduchi and shunthi in equal quantities along with pippali churna it possesses collective properties of digestive, appetizer, anti-inflammatory, mucolytic and antipyretic actions. Kantakari is beneficial for patients with sore throat, causing reduction in local inflammation in throat and respiratory tract. Patients also reported better mucociliary clearance. As per another study on Solanum, an improvement in PEFR and the reduction in other symptom scores indicated bronchodilator effect and reduced edema in the airway lumen [22].

Patients reported better appetite owing to the presence of Shunthi and Pippali. Dietary inclusion of dry ginger has shown to improve growth, apparent nutrient digestibility, gut morphology, serum chemistry, and stimulation of balanced intestinal microflora [23]. Its supplementation has shown alleviation of inflammation by reducing levels of TNF-α and hs-CRP without elevation in IL-6 levels [24].

Piperine in Pippali has been shown to enhance the bioavailability of structurally and therapeutically diverse drugs, possibly by modulating membrane dynamics due to its easy partitioning and increasing permeability. Pippali was added in fine powdered form in a dose of 250 mg as its higher doses and long term usage are not recommended [25]. Owing to grishma ritu (~Summer) it was used in a lesser dose.

Guduchi has been considered as a Rasayana known to promote longevity and delay ageing process [26]. In such acute infections its property to increase the number of WBCs would also help to neutralize the toxicity produced by any infectious pathogen.

T. cordifolia aqueous extracts have been reported to influence the cytokine production, mutagenicity, stimulation and activation of immune effector cells. In-vitro evidences shown that it up-regulates the IL-6 cytokines facilitating the acute response to injuries, inflammation, activation of cytotoxic T cells and also B cell diffraction [27,28].

S. vati whose prime constituent is Guduchi is a known antipyretic drug with potent Anti-inflammatory effects [29]. It was used here in a dosage of 500 mg twice daily.

The combined effects of Vyaghryadi Kashaya and S. vati were antipyretic, amapachana, appetizers, immunomodulatory, alleviating Kapha and Vata doshas. Kashaya also showed anti-inflammatory effects specifically on the respiratory channels which are chiefly affected in the novel Corona virus infection.

Drugs in Group B i.e. Shunthi and Rasona are capable of amapachana (digestion of metabolic wastes) and provide immunomodulatory action (~Rasayana). Better digestion and improved appetite was reported by most of the patients of this group.

Rasona has been mentioned as a potent alleviator of vata [30], a Rasayana in the patients of shosha (decreased physical strength) [31]. It is chiefly indicated in cough, asthma, hoarseness of voice and hiccups. It enables liquefaction and expectoration of Kapha (~mucous) by its volatile oils. In a dose less than 1.5 mg/ml garlic extract has also shown antiviral properties [32].

Kashaya and S. vati had an overall better effect than Shunthi and R. kalka. This might be due to the enhanced anti-inflammatory effects of Kantakari, added immunomodulatory effects of Guduchi present in kashaya as well as S. vati and presence of Pippali as an enhancer for action of drugs.

Control group patients were administered Vitamin C in a dose of 500 mg twice daily. Vitamin C also known as Ascorbic acid is one of the long known super nutrients said to boost immunity. It maintains the immune system comprehensively through antioxidant ability, collagen synthesis or directly strengthening immune cells fight against infection. Placebo controlled trials have shown quite consistently that the duration and severity of common cold

Table 5
Day-wise Negative tested COVID-19 patients in three groups.

	Day 0	Negative cases on Day 5	Negative cases on Day 7	Negative cases on Day 10	Negative Cases on Day 14	Test of Significance ^a
Group A	40 Positive cases	37	40	40	40	P < 0.001
Group B	40 Positive cases	35	39	40	40	
Group C	40 Positive cases	23	27	36	39	

^a Kruskal-Wallis' H test.

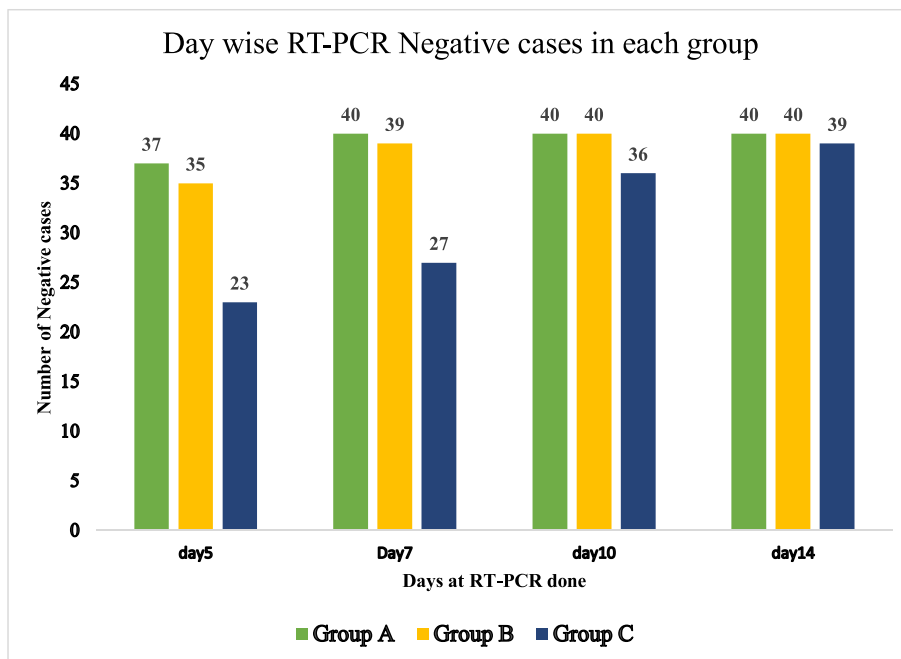


Fig. 1. Graphical Representation of Day wise Effect of Treatment in three Study groups considering RT-PCR results.

episodes are reduced in the vitamin C groups [33]. Controlled trials with human subjects reported a significantly lower incidence of Pneumonia in Vitamin C supplemented groups [34]. In control group also the disease progression to severe stages was not present. It could be possibly due to the combined effect of vitamin C, warm water intake, saline gargling and use of Onion.

Onion (*Alium cepa L.*) which was used by all patients has been said to alleviate *vayu* and improve appetite [35]. It has rich therapeutic properties of providing substantial relief in diseases such as common cold, fever, cough and respiratory ailments due to presence of Sulphur rich compounds and Quercetin in traces [36].

Warm water was advised to all the patients as it facilitates digestion and proper bowel evacuation along with alleviation of *kapha* and *vayu* [37] which may speed the disease recovery and

have a smoothening effect on throat and upper respiratory tract by its mucolytic action.

Patients were generally advised to gargle with saline water using rock salt to clear the throat and nasal cavity to prevent any extra mucous formation. Besides it also reduces local inflammation and relieves pain.

Patients admitted were advised to follow a healthy routine along with meditation in the form of *Pranayama* to improve the functioning of lungs by increasing their vital capacities and ensure better clarity of nasopharyngeal region. It also maintains a good oxygen supply to brain and heart to de-escalate stress produced due to disease. It ensures upholding all the physical, mental, psychological and spiritual alignments to attain positivity, calmness and good mental health.

The results obtained in groups A and B are important because majority of the patients tested negative on 5th day and remaining on 7th day which is useful in limiting the probability of spread of virus in community. It may be stated that response to the infection was better addressed by combined effects of systemic and local action (on respiratory system) by drug intervention of group A and B as compared to only systemic effect produced by *agni* enhancement in group B.

Statistically significant results were noticed in symptoms like fever, sore throat, cough and irritability in group A. In group B, symptoms progression to more severe stage was checked but it was statistically non-significant.

The advantage of it lies in controlling the spread among society and prevention of disease progression to a more severe stage.

5.1. Limitations of study

Since this was a pilot study only asymptomatic cases or mild cases were registered. Owing to limited financial resources, the immunological biochemical markers like Immunoglobulins, Interleukins and TNF α were not conducted in the patients enrolled. Studies including such biochemical markers may ascertain the action of the Ayurvedic drugs in a more effectual manner.

Table 6

Properties of drugs used.

Name of the drug	Pharmacological properties and medicinal use
<i>Kantakari (Solanum xanthocarpum Schrad. And Wendl.)</i>	Anti-asthmatic Anti-cough Anti-inflammatory Bronchodilatory
<i>Guduchi (Tinospora cordifolia Thunb.)</i>	Anti-inflammatory Anti-allergic Anti hepatotoxic Very low toxicity <i>Rasayana</i>
<i>Shunthi (Zingiber officinale Roscoe.)</i>	Appetizer, Carminative Anti-inflammatory effects
<i>Pippali (Piper longum L.)</i>	Anti-oxidant Anti-inflammatory Hepatoprotective Immunomodulatory action Anti-microbial
<i>Rasona (Alium sativum L.)</i>	Bioavailability enhancer [38] Immunomodulatory effects Anti-viral property

6. Conclusion

The most significant finding in this study was that faster viral clearance and better symptomatic improvement was noticed in Groups A and B as compared to the control group. A restraint was observed in the disease progression to rigorous stages. It can be concluded that Ayurveda drugs having properties to act on *agni* and *pranavaha srotasa* can be used effectively against COVID-19 infection. Due to encouraging outcomes of this trial, these drugs can be used in clinical practice, too. This paves way to an integrated approach wherein limiting the community spread and progression to severe stages is the key for improving recovery rate and reducing mortality.

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Author CRediT statement

Adil Rais: Conceptualization, Methodology, Investigation, Writing-Original draft.

Devendra S Negi: Conceptualization, Methodology, Validation, Supervision.

Amita Yadav: Resources, Project administration.

Absar Ahmad: Data curation, Formal analysis, Writing-Original draft.

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Himanshu Arya: Funding Acquisition, Resources.

Ramji Verma: Funding acquisition, Project administration.

Mahendra Yadav: Investigation.

P.N. Ahirwar: Resources.

Conflict of interest

None.

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