An Ayurvedic personalized prophylactic protocol in covid-19

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**Title**: An Ayurvedic personalized prophylactic protocol in covid-19

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1. Background

Severe acute respiratory syndrome- corona virus 2 (SARS-CoV-2), a novel β corona virus (CoVs) which is responsible for the pandemic pneumonia of 2020 is continuing its wrath worldwide [1]. The family of CoVs lately, have been the pathogens of emerging respiratory disease outbreaks in humans [2]. Scientists from various global health research organizations are desperately putting efforts into research on SARS-CoV-2 pathogenic mechanisms for developing prophylactic - therapeutic measures that would contain the transmission of this highly contagious virus and effectively reduce the number of casualties. Also, the pathological mechanism that is leading to severe stages of pneumonia is under scrutiny.

The symptoms and mortality associated with CoVID 19 outbreak is supposed to be because of derangement in host immune homeostasis [3]. Further, it is assessed that asymptomatic cases of CoVID 19 account for pervasive transmission of the virus globally [4]. In summary, replication, widespread transmission and threatening the host immune homeostasis is the evident mode of attack of this virus. As vaccine development process is experiencing an undue delay in this pandemic scenario; creating an effective host response in the form of eliminating pathological microbes, avoiding untoward responses which produce excessive tissue damage and creating a pro-environment to establish tissue homeostasis is the key to sustain now, or as a matter of fact while any such highly contagious microbial attack in near future. Thus pre-post exposure prophylactic strategies that aim at improving host response mechanisms are decisive to contain the mortality rates associated with such pandemics [4]

Immune homeostasis is distinctive or individualistic [5]. Factors such as genes, gender, nutrient status, age, gut flora, dietary habits, physical activity, alcoholism and other substance abuse, pregnancy etc highly determines the cross sectional immune status of individuals. Hence personalized medicine is the key for achieving better host homeostasis in pan immune system ailments afflicting humans, infectious or otherwise. Now, if we can predict the extent of insult that could possibly happen in an infected case and then adopt personalized prophylactic treatment measures, it would be phenomenal.

We present a hypothetical model which emphasizes that predictive immune responsiveness based on Ayurvedic concept of fundamental bodily constitution, namely the ‘prakruti’; and subsequent personalized prophylactic-therapeutic measures in diagnosed cases of CoVID 19 and in cases quarantined for high to low risk primary contact with a CoVID 19 case may generate promising evidence conversely to general administration of immunomodulators [[6] (Vimanasthana/Chapter 8/Verse 95-98)). Our hypothesis is based on the fact that the initial host response, adaptive immune mechanisms, immune homeostatic physiology and other arms of immune phenotyping is significantly derived and influenced by prakruti of individuals [7,8]. Also, the influential model of healthcare practice termed as ‘dasa vidha pareeksha’ revealed by Charaka wherein prakruti, pathological examination [vikruti; with regards to causative factors, dosha status, prakruti, seasonal, geographical factors and immune factors], tissue related
homeostasis [saara], physique [samhanana], psychological state [satva], acclimatization to environmental variations [satmya], metabolic wellness [ahara shakti] physical endurance [vyayama shakti] and age [vaya] are critically analyzed to achieve the predictive personalized therapeutic efficacy; stands as a significant background to our hypothesis [(Vimanasthana/Chapter 8/Verse 94)]. This hypothetical model intends to discuss the significance of prakruti assessment in screening/predicting those who may fall into deteriorating states if afflicted with CoVID 19 infection. Also, we discuss the predictive and planned process of yielding individual host immune homeostasis through prakruti based personalized therapies which may have the potential of reducing chances of untoward events of an aggravated immune responsiveness and subsequent inflammation driven tissue destruction which are candidate causes for CoVID 19 related casualties.

2. Ayurveda and Predictive Medicine in CoVID 19 symptomatology

2.1. CoVID 19 symptomatology and Jwara principle (Tables)

Jwara (fevers of varied origin) is detailed in chikitsa sthana, nidana sthana and uttara sthana of Brihatrayee (Charaka Samhita, Susruta Samhita and Ashtanga Hrudaya) and in subsequent textbooks of Ayurveda. Seeing the amplitude of classification of jwara symptoms into different subsets, and its positioning in the initial pages of therapeutics in relevant classic Ayurvedic literatures; it is inferred that the disease manifestation and progression into deteriorating states termed as sannipata avastha in jwara may be implied to different disorders explained subsequently to jwara as well. Understanding jwara symptomatology is important in assessing any disease progression and severity with respect to clinical and biochemical host responses.

2.2. Sickness behaviour and Jwara Poorvarupa principle

Sickness behaviour with respect to Behavioural Immune System refers to behavioral, cognitive and emotional symptoms that go along with infection, such as fatigue, loss of appetite and social interest. This is believed to eventually reduce the direct and indirect contact between an infected host and his nearest relations. There is also an emotional reaction termed as ‘disgust’ towards peculiar sights and smells, body secretions etc. These changing behaviours represent an early anti pathogenic defense system [9].

These sickness features of behavioural immune responses are detailed as prodromal phase (jwara poorvarupa state) in Ayurveda. Why jwara poorvarupa state diagnosis is important clinically? Prophylactic-therapeutic measures are advocated from the poorvarupa state in jwara [(eg. internal administration of medicated ghee (snehapana) in vatika jwara poorvarupa, therapeutic purgation (virechana) in pittaja jwara poorvarupa)] and administering such measures in this phase may positively decelerate the disease progression and initiate an early tissue homeostasis. Table 01 represents the jwara poorvarupa symptoms and its comparison with CoVID 19 symptomatology. Whether this sickness behaviour can be systematically measured in CoVID 19 positive cases or in cases quarantined for an evident primary contact with a positive
case in their respective incubation periods, is debatable. But if it’s achieved, this shall be the appropriate phase to initiate prophylaxis or treatment. The poorvarupa stage diagnosis needs a detailed history taking along with emotional, cognitive and behavioural analysis.

2.3. Differential understanding of specific types of Jwara with respect to CoVID 19 symptoms

Fig 01 represents CoVID 19 disease progression in an Ayurvedic parlance. Tables 02, 03 and 04 correspond to the comparison of specific jwara subsets mentioned in Fig 01 with CoVID 19 symptomatologies (bibliography [1,2,3,4,5,6]). Thus while analyzing different subsets of jwara based on site of manifestation, symptoms and severity; CoVID 19 or as a matter of fact any infectious fever emerging as a respiratory illness reflects features of Kaphaja jwara/ Vatakaphaja jwara or Pralepaka (Table 02); Vishama jwara (Anyedyu/Anyedyu vipryaya/ Chaturthaka/ Chaturthaka viparyaya/Tritteeyaka), Asthi majja gata jwara (Table 03); and Sama Sannipata jwara (Table 04) [6] (Chikitsa sthanal Chapter 3/ Verse 61-108); [10] (Nidana sthanal Chapter 2/ Verse 22-45); [11] (Uttara sthanal Chapter 39/Verse 33-91)). Fig 01 explains how the differentiation of jwara into different subsets is individualistic, which is influenced by one’s prakruti, agni (primary metabolism and cellular energy transfer) and sara (internal tissue homeostasis).

Vishama jwara refers to a chronic existence of morbid factors in the body post inappropriate management of any type of jwara, leading to derangement in tissue homeostasis (dhathu pradooshana) [11] (Uttara sthanal Chapter 39/Verse 66]). External causative agents like microbes (Bhutabhishanga) almost and always may result in vishama jwara or sannipata jwara where there is insidious provocation of three pathophysiological entities that govern major physiological activities in the human body (doshas) namely vata, pitta and kapha, all at once [11] (Uttara sthanal Chapter 39/Verse 68); [12]]. This precisely impairs primary gut metabolism and manifests as jwara. The site of manifestation of symptoms gives clue into diagnosis of vishama jwara subsets. For eg, if there is arthralgia (doshas at joints) it is Pralepaka variety of jwara manifestation and if respiratory symptoms primarily manifest (doshas at chest region) it is Anyedyu. If there is a combination of respiratory and digestive complaints (doshas at chest region and upper GIT), it is diagnosed as Anyedyu-viparyaya. Why such differential understanding is important? Internal medication varies accordingly. Vangasena explained Abhinyasa jwara, where he mentioned it as sannipata jwara stage in which a slimy, threadlike sputum secretion and obstruction in upper respiratory tract was a clinical manifestation [10] (Ayurveda Rasayana commentary, Nidana sthanal Chapter 2/ Verse 33)). Sisruta mentioned ojonirodhaja jwara, a severe stage in sannipata jwara manifestation, where there is deterioration of internal homeostasis and tissue physiology (ojo visramsa) [11] (Uttarasthanal Chapter 39/Verse 43-44)). Swasanaka jwara is a cluster of symptoms explained by Bhavaprakasha wherein sannipata jwara leads to morbid respiratory illness and distress.

Fig 01 hypothesizes the differential manifestation of aforesaid jwara in individuals with different prakrutis. A final diagnosis of the diseased state is highly dependent on doshik constitution and subsequent symptomatology, general health status, digestive capacity etc. This
differential understanding and specificity is important in personalized prophylactic-therapeutic advocacies.

3. Immune mechanism and Prakruti.

Disease susceptibility, and selection of prophylactic and therapeutic measures as per Ayurveda significantly depends upon, prakruti. Notably, immune mechanisms (bala) are determined by prakruti of individuals [[6] Vimana sthana/ Chapter 8/Verse 96-98]; [11] Sootrasthana/Chapter 28/ Verse 7]

Congruent with this statement, an immunophenotyping study based on CD marker expression (CD14, CD25 and CD56) on different human dosha prakrutis concluded that pitta predominant prakruti individuals exhibited elevated innate immune responses and were hypersensitive. Kapha predominant prakruti individuals had higher expression of CD25 and CD56 exhibiting stable immune responses. Compared to kapha prakruti, vata predominant prakruti individuals showed compromised at low potential immune responses [7]. Further, another study on genome expression and biochemical correlates of prakruti stated that vata prakruti individuals exhibited a distinct down regulation of genes involved in response to biotic stimulus and inflammatory response [8]. Also, the cholinergic anti inflammatory pathway, a function of efferent vagus nerve plays a significant role in controlling systemic and local inflammation paving way to neuronal immunomodulation [13]. A discussion paper, while identifying neurological systems that represent vata dosha, formulated hypotheses on links between vata dosha and vagus nerve [14].These leads suggest that vata dosha dysfunction or an exaggerated vata dosha physiology, as in vata predominant prakruti may hamper immunomodulation.

Conversely, pitta predominant prakruti individuals demonstrated over expression of genes related to immune response based on more pathogen recognition receptors, more inflammation and hypersensitivity. Kapha prakruti individuals presented with an overall up-regulation of genes involved in cellular bio synthesis and purine salvage pathway. B and T cell receptor signaling pathways (for adaptive arm of immune mechanism, [15]) were found enriched in over expressed genes of kapha prakruti predominant males. Thus comparatively, a better synergy between innate and adaptive immunity and better adaptive host immune response is exhibited by kapha prakruti predominant individuals whereas intense immune response symptoms that at times result in an exaggerated inflammation driven destructive phase may be substantiated in pitta predominant prakruti individuals. Fig legend 01 represents the basic differences in immune responses with respect to different prakrutis.

4. Concept of Pitta dosha, Ama and Inflammation driven damaging phase of Immune response.

Pitta dosha, one among the three doshas is causally linked with inflammation and immune mechanism [[11] (Sootra sthana/ Chapter 17/ Verse 7)]. Notably, pitta dosha is responsible for digestion, metabolism, thermoregulation and energy homeostasis and is causally associated with jwara as well [[10] (Sootra sthana/ Chapter 11/ Verse 2)]. Pitta dosha manifests
as *agni*. The concept of *agni* is appropriately translated in a study as the primary entity responsible for metabolic and transformative processes at physiological and cellular levels [16]. *Ama* or *ama* dosha refers to substance formed as a result of improper metabolism at varied physiological levels and hence it is non homogenous to the bodily tissues [[6] (*Chikitsa sthana*/Chapter 15/ Verse 42-43]).

*Ama dosha* is at times referred to *ama visha* or a toxic substance which is capable of tissue damage [[6] (*Chikitsa sthana*/Chapter 15/ Verse 44)]. *Ama* also serves as a candidate causative agent for *jwara*. It is therefore not surprising if it is inferred that recognition of *ama* by host cells may be as a ‘non-self’ which triggers host immune responses. Elaborating this statement, *ama* thus may also be inferred as an excess accumulation of endotoxins and other inflammatory mediators. *Pitta dosha* predominant *prakruti* refers to an increased physiological activation of *pitta dosha* compared to *vata* and *kapha* at varied levels. Accordingly and from evidence generated from above cited studies on immune mechanisms and *prakruti*; it is hypothesized here that *pitta dosha* predominant individuals shall be more prone to an earlier inflammation driven damaging phase of immune response termed as the ‘cytokine storm’, the phenomena observed in certain individuals infected with SARS-CoV-2 which is causally linked with casualties of CoVID 19 [4]. The cytokine storm and subsequent immunological reactions and toxicity may be understood in terms of *ama visha* induced *jwara*.

Further, the study on genome expression and *prakruti*, found that expression of genes which affected hemoglobin levels namely HBA1, HBB, NOV were found high in *pitta dosha* predominant individuals compared to *vata* and *kapha* types indicating higher hemoglobin levels in the former [8]. Hemoglobin and other components of erythrocytes are potential constituents of innate immunity, competent of generating reactive oxygen species (ROS) that perturb the immune homeostasis by inducing inflammation driven immune reactions, sepsis and shock [17]. *Prakruti* is assessable [8]. Hence identifying the prakruti of people diagnosed with CoVID 19 or who are known to have a primary contact with a positive case, shall help to screen (predict) those individuals who can fall into deteriorating states and also may prove crucial in adopting timely and *dosha* specific prophylactic-therapeutic measures.

5. **Virechana, Basti and Rasayana in regulating host immune responses.**

*Virechana* refers to therapeutic purgation which is indicated in *pitta dosha* related disorders [[10] (*Sootrasthana/ Chapter 1/ Verse 24); [18]]. Notably *virechana* is also indicated in *jwara, ama dosha* and respiratory ailments like, *swasa* (asthmatic conditions) and *kasa* (chronic cough), considering the pathogenesis and site specificity of CoVID 19 affliction [[6] (*Sidhi sthana* 2/13)]. Effectiveness of *virechana* in *amavata* (rheumatoid arthritis), and *vicharchika* (atopic dermatitis) is reported where there is evident involvement of deregulated immune homeostasis [19, 20, 21, 22]. Anti inflammatory effects of *virechana* is also reported [19]. Surprisingly, antirheumatic treatment strategies have also been factually suggested in CoVID 19 [3]. Hence we propose periodic person centered *virechana* starting from the *poorvarupa* state itself as a prophylactic measure in diagnosed cases of CoVID 19 with mild to moderate symptoms as well as high to low risk primary contact cases (with an infected individual) and essentially who have *pitta* predominant *prakruti*. It is also recommended in other *prakruti*
individuals keeping in mind the forthcoming respiratory concerns in CoVID 19. Further, the procedural administration of any panchakarma procedure like virechana are to be planned following norms specifically mentioned under each procedure.

Vata predominant prakruti individuals are of alpa bala (deteriorated health status) [[6] Vimana sthanal Chapter 8/ Verse 98). Accordingly, the above cited studies on immune mechanisms and prakruti concluded a reduced or compromised immune response in vata prakruti individuals making them more prone to infections [7,8]. Connecting the above statements, we hypothesize that although vata prakruti individuals may be more prone to infections of varied origin including the current viral outbreak, they may not enter into severe or deteriorating stages of tissue damage caused by the immune response. In summary, there is a comparatively lesser chance that the inflammation driven destructive phase of immune response be triggered in an infected CoVID 19 case who is of vata predominant prakruti. Notably, respiratory functions are highly influenced by vata dosha [[10] (Sootra sthanal Chapter 11/Verse 1); (Sootrasthana/ Chapter 12/ Verse 4)]. Thus a pro environment should be created in such individuals to have a better immune homeostasis and healthier states.

Basti therapy refers to therapeutic enema which is specifically indicated in vata disorders or vata dosha aggravated states. The medicaments in basti are expected to reach the proximal colon [23]. The gut is the abode of diverse microbiome. The gut microbiota consist of complex organisms that significantly influence host immune homeostasis [24]. The gut microbiome displays prakruti specific differentiation in microbial colonies [25]. Therefore it is not surprising that there are precise types of basti indicated in specific diseased conditions. For instance, Tikta Ksheera Basti is indicated in Asthi majjagata vata [[6] (Sootra sthanal Chapter 28/ Verse 27)]. Asthimajja gata vata [disorders of bone and bone marrow origin] is a syndrome with features of balakshaya or altered host homeostasis [[6] (Chikitsa sthanal Chapter 28/ Verse 33)]. The role of bone marrow in host immune mechanism is fundamental. Surprisingly, an aforesaid type of vishama jwara, namely the chaturthaka jwara (which resembles features of CoVID 19 significantly) manifests as a result of doshas at the level of bony tissue and bone marrow (asthi and majja dhathu). A study has reported ankylosing spondilitis as a type of asthimajjagata vata, wherein host immune homeostasis is altered and one of the treatment modalities adopted was Basti [26]. Erandamooladi yapana basti explained in the context of healthy longevity is commonly administered in vata kapha disorders [[6] (Sidhi sthanal Chapter 12/ Verse 16)]. Moreover, the hypothetical link between vata dosha and immunomodulation suggest the utilization of basti in immunocompromised vata predominant prakruti individuals or as a matter of fact any individual in the resolving phase of immune responses, inorder to bring back immune homeostasis. Also, there are scientific leads stating efficacy of virechana and basti in essential hypertension, obesity, hyperlipidemia and diabetes mellitus, making these procedures suitable in field trials [27].

Hence we propose person centered prophylactic basti therapy (with all precautionary measures like personal protective equipments for administering personnel, with standard CoVID
care facilities) in vata predominant prakruti individuals either diagnosed with CoVID 19 affliction or those who are quarantined for a high to low risk primary contact with a positive case. Also we suggest basti treatment in individuals of any prakruti while in resolving phases of immune response triggered by CoVID infection, to initiate a quicker immunomodulation for bringing about immune homeostasis.

Rasayana therapy (rejuvenative means) is always indicated after shodhana (biopurificatory measures). Of the many benefits of rasayana therapy, immunomodulating and tissue homeostatic effects of rasayana holds good in this context. There are tested Ayurvedic single herbs exhibiting immune-adjuvant, immunosuppressant or immunostimulant activities targeting innate and adaptive immune responses [28]. There are scientific leads emerging which propose the use of single herbs such as Ashwagandha in immune homeostasis especially in CoVID 19 cases [4]. Articles are lately being published highlighting several tissue specific host homeostasis and immune regulators (naimittika rasayanas) and single herbs with respect to the CoVID 19 symptoms [29]. There are many poly herbal formulations that are real time tested rasayanas.

6. Bridging Predictive medicine with stage wise CoVID 19 management strategy

Based on the above discussion, we hereby propose a person centered prophylactic-therapeutic strategy based on prakruti, intended for effective host immune responses in CoVID 19 diagnosed cases (with mild to moderate symptoms) and in quarantined cases for high to low risk primary contact with a CoVID 19 case (avoiding cases presenting with any sort of respiratory distress). We also propose a community level personalized Ayurvedic prophylactic protocol taking leads from the DOTS model [30]

6.1 Prophylactic – Therapeutic Internal medications in CoVID 19 protocol

Instead of prescribing single herbs/ herbal extracts in a particular diseased state manifested in the community, as in an outbreak; Ayurveda mostly recommends pharmacodynamically balanced poly herbal formulations as specific person centered therapeutic strategy in illnesses. Clinically too, such advocacies are much more promising than a single herb or a herb extract which is prescribed irrespective of individualistic physiological-pathological states. Poly herbal formulations are stable compounds and are therefore safer and more effective when compared to single herbs or herbal extracts especially when there is a tissue homeostatic crisis as in CoVID 19 [31]. Evidences support the efficacies of potent immunomodulatory, anti-inflammatory, antimicrobial, antioxidant (rasayana and non rasayana) herbs that are present in commonly practiced polyherbal formulations and which are specifically indicated in particular diseased states or in comorbid conditions [32,33]. Table 05 contains the list of various formulations in different forms that may be incorporated as internal medications for the protocol in a blackbox frame, where the vaidya is free to logically select the medicament based on personalized day today status of health domains. The list contains medicaments which are indicated in basal metabolic errors (ama dosha), hyperinflammation, oedema, fever, respiratory ailments and which have immunomodulating/rasayana effects.
6.2 Proposed person centered prophylactic-therapeutic protocol for enhancing host immune responses in CoVID 19.

Fig No 02, 03 and 04 with respective Fig legends represents the schematic diagram of the proposed protocols. In summary, different types of virechana (like snigdha virechana, rooksha virechana etc) based on individualistic prakruti patterns along with specific internal medications have been highlighted as a prophylactic measure in different stages of CoVID 19 manifestation or as a general prophylactic measure to manage the inflammation driven immune response phase of the disease. Basti and rasayana treatment along with specific internal medications are highlighted in the resolving phases of an exaggerated immune response for a quicker immunomodulation and subsequent immunohomeostasis.

6.2.1 Outcome measure to assess changes in host immune responses while and after the intervention

The protocol is proposed with the objective of imparting better personalized host immune responses. Hence, the following may be assessed while the intervention and as an outcome measure to quantify the changes in host immune responses if any.

1. To assess the host immune homeostasis and inflammatory levels after intervention [4, 34,35]

   Th1/Th2 cytokine balance/ viral load by RTPCR/ multi colour flow cytometry/ CBC with stain analysis/TNF α/IL-1/ IL-6 for assessing the inflammatory status

2. To assess the host immune functional homeostasis after intervention

   Incidence and severity of any infection/ Differential blood count/ Total count/Erythrocyte Sedimentation Rate/ C- Reactive Protein levels.

7. Conclusion

Host immune responses are very much distinctive and thus personalized prophylactic or therapeutic measures are decisive to sustain in a highly contagious outbreak such as CoVID 19. Time tested and real world experience based traditional knowledge should be experimented while such pandemics within a broad frame work of personalized immune homeostasis which is adjusted day to day on the basis of symptomatic response and other quantitative or functional host immune response parameters. Through a hypothetical model we tried to explore the odds of adopting prakruti based personalized medicine in prophylactic-therapeutic management aimed at improving host immune homeostasis. It is a matter of fact that adopting personalized treatment strategies in epidemics or pandemics is of course a controversial topic with respect to its feasibility. Yet, we believe manifestation of any illness in an individual (be it an epidemic manifestation) is significantly dependent on his physiology, as it’s observed that not all individuals succumb to a cytokine storm or pneumonia or respiratory failure in case of CoVID
affliction. Thus there are definite personalized factors that determine the fate of any illness, even in pandemics.

Our hypothetical model discusses the significance of prakruti assessment in predicting the chances of falling into deteriorating states of immune hyper activation following a CoVID infection. This model may be analyzed for testing in controlled integrative settings along with standard care in people who are at risk for primary contact with positive cases or who have mild to moderate symptoms of CoVID attack. Community level implementation of Ayurvedic prophylactic measures is also hypothesized. We put forward a novel person centered approach which may positively induce a better host immune homeostasis by reducing the chances of untoward events of aggravated immune responsiveness and subsequent inflammation driven tissue destruction which are candidate causes for CoVID 19 related casualties.
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**Fig 01 Legend:** Schematic diagram representing CoVID 19 disease progression in Ayurvedic Parlance.

Antigen invasion (*agantu nidana*), is causally linked with dysfunction of host *dosha* homeostasis that fundamentally affects primary metabolism (*agni*), manipulates thermoregulation (*swedavaha srotorodha*) and induces *poorvarupa* (sickness behaviour). *Poorvarupa* symptoms cluster is a candidate factor to assess the dysfunctional *dosha* constitution. If not appropriately intervened, *poorvarupa* state advances to *Jwara*. The type and severity of *jwara* manifested is significantly dependent on *prakruti* and *saara* (endurance and tissue homeostasis).

**Fig 02 Legend:** Schematic diagram representing proposed Ayurvedic personalized prophylactic protocol in CoVID 19 positive cases.

Phase 01 represents the *poorvarupa* state (Sickness behaviour phase), wherein *shamana snehapana* (internal administration of sneha i.e., medicated ghee/oil), *virechana* (therapeutic purgation) and specific *shamana oushadha* (disease/dosha specific medicaments) are proposed based on predominant *prakruti* as a prophylactic measure. *Vicharana snehapan* refers to lesser doses of sneha administration either admixed with food or through specific non oral routes like enema. *Acchapana* refers to higher doses of direct sneha administration. *Mridu sadya virechana* refers to instant induction of mild purgation. Phase 02 represents the onset of symptoms, wherein different types of *virechana* are proposed like snigdha or ruksha based on prakruti and dosha status. Phase 03 depicts the resolving phase of immune response wherein different *bastis* (therapeutic enema) and specific *rasayanas* are highlighted considering a better and a quicker immunomodulation after the viral attack. *Shamana oushadha* shall be tailored to subjective day to day symptom presentation. Severe cases or cases reporting any complication shall not be considered for *Panchakarma* therapy.

**Fig 03 Legend:** Schematic diagram representing proposed Ayurvedic personalized prophylactic protocol in high to low risk primary contact with a positive case.

Proper *panchakarma* therapy highlighting *virechana*, for preventing the inflammation driven tissue destructive phase of SARS CoV2 induced immune response is highlighted. This is followed by specific *bastis* for initiating immunomodulation as a prophylactic measure.

**Fig 04 Legend:** Schematic diagram representing the proposed Ayurvedic community level prophylactic protocol – a hypothetical DOTS model.
Following the DOTS model of therapeutic intervention famous for TB surveillance and treatment, a community level *Ayurvedic* prophylactic protocol in CoVID 19 is proposed.

Tritiyaka
Chaturthaka
Chathuthaka-viparyaya

Sama
sannipata
jwara
(Ojonirodhaja
jwara
(Swasanaka)

Pralepaka
Anyedhu
Anyedhu-viparyaya
**Table No 01. Poorvarupa in Jwara Vs CoVID 19 symptomatology**

| Poorvarupa symptoms                                      | CoVID 19 symptoms |
|----------------------------------------------------------|-------------------|
| *Srāma (clinical correlation)* – fatigue                 | ✓                 |
| *Arati* – malaise                                        | ✓                 |
| *Vivarnatvam* – discoloration or various cutaneous changes\(^1\) | ✓                 |
| *Vairasya* – bad taste or loss of taste                  | ✓                 |
| *Nayanaplava* – watering of the eyes or epiphora\(^2\)   | ✓                 |
| *Icchadeshoumuhuhu* – rapidly changing likings or rapid mood swings\(^3\) | ✓                 |
| *Jrumbha (vata)* – yawning (due to fatigue)              | ✓                 |
| *Angamarda* – bodyache (myalgia or arthralgia)           | ✓                 |
| *Guruta* – feeling of heaviness                          | -                 |
| *Romaharsha* – horripilation                             | -                 |
| *Aruchi* - anorexia                                      | ✓                 |
| *Tamapravesha* – appearance of darkness in front of the eyes (due to excessive drowsiness?) | ✓                 |
| *Apraharsha* – hypoactive sexual desire                   | -                 |
| Condition                                      | Description                                                                 |
|------------------------------------------------|----------------------------------------------------------------------------|
| **Seeta** – chills                             | ✓                                                                           |
| **Anannabhinandana (Kapha)** – aversion of food (included in anorexia)   | ✓                                                                           |
| **Nayanayordaaha (Pitta)** – burning sensation in eyes (due to conjunctivitis) | ✓                                                                           |
| **Alasya** – laziness (due to fatigue)         | ✓                                                                           |
| **Gatragourava** – feeling of heaviness in body parts | -                                                                         |
| **Hitopadeshaakshanti** – aversion to good advices (sickness behaviour/ depressive mood?) | -                                                                         |
| **Baladwesha** – irritability (sickness behaviour/ due to rapid mood swings/ depressive mood?) | ✓                                                                           |
| **Vinamana** – adopting a sickness posture, head down | -                                                                         |
| **Pindikodweshtana** – calf pain or localized myalgia | ✓                                                                           |
| **Klama** – tiredness (due to fatigue)          | ✓                                                                           |
| Kaphaja/ Vatakaphaja jwara symptoms | CoVID 19 symptoms |
|-----------------------------------|------------------|
| Tapahani- Low grade fever (mild and moderate cases)<sup>4</sup> | ✓ |
| Aruchi- anorexia | ✓ |
| Parvashiroruk – arthralgia<sup>5</sup> & headache | ✓ |
| Peenasa – rhinorrhoea | ✓ |
| Swasana – dyspnea | ✓ |
| Kasa – cough | ✓ |
| Vibandha – constipation | - |
| Seeta– chills | ✓ |
| Jadya – stiffness | ✓ |
| Timira - appearance of darkness in front of the eyes (due to excessive drowsiness?) | ✓ |
| Bhrama – dizziness<sup>6</sup> | ✓ |
| Tandra – drowsiness | ✓ |
| Hritlepa – pressure in the chest or chest tightness<sup>6</sup> | ✓ |
| Chardana – vomiting | ✓ |
| Seetapitika/ Uarda – urticaria¹ | ✓ |

Table No 03. *Chathurthaka Jwara/ Asthi-majjagata Jwara Vs CoVID 19 symptomatology*  

| Chathurthaka Jwara | CoVID 19 symptoms |
|---------------------|-------------------|
| Tamaprapvesa - appearance of darkness in front of the eyes (due to excessive drowsiness?) | ✓ |
| Kasa – cough | ✓ |
| Mahaswasa – dyspnea | ✓ |
| Antardaha – burning sensation inside the body | - |

| Asthimajjagata jwara |
|----------------------|
| Asthibhedha – arthralgia | ✓ |
| Swasa – dyspnea | ✓ |
| Vireka – diarrhoea | ✓ |
| Chardi – vomiting | ✓ |
Table No 04. Symptoms of Sama-Sannipata- Jwara vs CoVID 19 symptomatology*

| Sama-Sannipata-Jwara                                      | CoVID 19 symptoms |
|-----------------------------------------------------------|-------------------|
| Kshanedaha & Kshanesheeta - Dysfunctional thermoregulation | -                 |
| Asthisandhiruja- arthralgia                               | ✓                 |
| Shiroruja- headache                                       | ✓                 |
| Saasraavekalusheraktelochane– epiphora and conjunctival congestion | ✓                 |
| Saswanaukarnau & Karnaruja                               | -                 |
| Kanthashookairiva– sore throat                            | ✓                 |
| Tandra– drowsiness                                        | ✓                 |
| Moha– coma (septic shock)                                 | ✓                 |
| Pralaapa– loss of orientation                             | ✓                 |
| Kaasa– cough                                              | ✓                 |
| Shwaasa– dyspnea                                          | ✓                 |
| Aruchi– anorexia                                          | ✓                 |
| Bhrama– dizziness                                        | ✓                 |
| Paridadgha, Kharasparshajhwa – changes in tongue texture   | -                 |
| Symptom                                      | Description                                                                 |
|----------------------------------------------|-----------------------------------------------------------------------------|
| Srastaangata                                 | feeling of fatigue/laxity in body parts                                     |
| Kaphayuktaraktashteevanam                    | sputum production                                                         |
| Shiraslothanam                               |                                                                             |
| Trishna                                      | excessive thirst (may occur due to diarrhea)                                |
| Nidraanaasha                                 | sleeplessness                                                               |
| Hridivyadha                                  | chest tightness                                                            |
| Chiraat and alpasweda, mutra and purisha     | dysfunctions in thermoregulation, urinary output, constipated bowels        |
| Pratatamkanthakoojanam                      | moaning/howling                                                             |
| Shyaava, Raktakotha and mandala              | Livido reticularislesions?                                                 |
| Mookatwam                                    | mute (sickness behaviour, depressed mood)                                   |
| Srotopaaka                                   | inflammed auricle/ear canal                                                |
| Udaragauravam                                | heaviness in the abdomen                                                    |
| Chiraatpaakashchadoshaanaam                  | chronic nature                                                             |
| Maranam                                      | impending death                                                            |
| Upadrava                                     | inflammation and oedema over mastoid process (skull)                        |
| Sl.No. | Pharmaceutical form | Name of Medication with reference |
|-------|----------------------|----------------------------------|
| 1.    | Kashaya (Decoction or in the form of hot infusion) | Indukantam Kashaya (Based on SY.Ghrita prakarana) Pathyakusthumbaradi Kashaya (AH.Ch.S.1/62-63) Vyaghradi Kashaya (AH.Ch.S.1/61) Amruthotharam Kashaya (SY.Kashaya prakarana) Punarnavadi Kashaya (SY.Kashaya prakarana) Elakanadi Kashaya (SY.Kashaya prakarana) Nayopayam Kashaya (SY.Kashaya prakarana) Bharngyadi Kashaya (SY.Kashaya prakarana) Sthiramoola Ksheera Kashaya (AH.Ch.S.21/17) Brihat Nayopayam (SY.Kashaya prakarana) Ardhaivilwam Kashaya (SY.Kashaya prakarana) Abhayapippalimooladi Kashayam (AH.Ch.S.1/54) Drakshadi Kashaya (SY.Kashaya prakarana) Guduchyadi kashaya (AH.Su.S.15/16) Patolamooladi Kashaya (SY.Kashaya prakarana) |
| 2.    | Gutika/ Vati (Tablet) | Vilwadi Gutika (AH.Ut.S. 36/84) Vettumaran Gutika (SY.Vati prakarana) SanjeevaniVati (Sa. S. Ma.7/28-33). Chukkamtippalyadi Gutika (SY.Vati prakarana) MukkaMukkutavadi Gutika (SY.Vati prakarana) |
| 3.    | Rasayana Leha (Linctus) | Agastyarasayana (AH.Ch.S. 17/57) Chyavanaprasham (AH.Ut.S.39/34-41) Pippali rasayanam (AH.Ut.S.39/97-100) Shirishadya Avaleha (based on BR.M.Sandhana Kalpana) |
| 4.    | Choorna (Powder) | Talisadi Choorna (AH.Ch.S 5/58-60) Vyoshadi Vatakia (AH.Ut.S 20/5-6) Sitopaladi Choorna (AH.Ch.S. 5/33-34) Nishamlaki Choorna (AH.Ut.S. 40/48) Avipathy Choorna (AH.K.S.2/21-23) Sudarshan Churna (SA.S.M.Churna prakarana) Guduchi Satva (YR. Rajayakshma Chikitsa) Vaiswanara Churna (SY.Churna prakarana) |
|   | Arista (Fermented formulations) | Amritarista (SY.Arishtasava prakarana)  |
|---|---------------------------------|----------------------------------------|
|   |                                 | Vasarista (SY.Arishtasava prakarana)    |
|   |                                 | Kanakasava (SY.Arishtasava prakarana)   |
|   |                                 | Pippalyasavam (SY.Arishtasava prakarana) |

|   | Ghrita/ Taila (Medicated ghee/oil) | Indukantha Ghrita (SY. Ghruta prakarna) |
|---|-----------------------------------|----------------------------------------|
|   |                                   | Tiktaka Ghrita (AH.Ch.S. 19/27)         |
|   |                                   | Rasnadashamoola ghruta (AH.Ch.S. 3/56)  |
|   |                                   | Eranda Taila (AH.Su.S.5/57-58)          |

*Citation in Bibliography.

**Abbreviations in Table No 05.**

1. AH – Ashtanga Hrudaya
2. BR – Bhaishajya Ratnavali
3. SA – Sharngadhara Samhita
4. SY – Sahasrayoga
5.YR – Yogaratnakara
Agantu Nidana (External causative agent: SARS CoV 2) -> Dysfunction of Tridosha Homeostasis

- Innate Immune response Activation
- Specificity in Dosha vitiation

Manifestation of Jwara

Adaptive immune response activation

VATA Predominant: Down regulated immune mechanism/lower immune response -> Vata pradhan Vishama jwara

PITTA Predominant: Intense immune response/ exaggerated inflammation -> Ama visha (Excess inflammatory mediators)

KAPHA Predominant: Better Synergetic/stable immune response -> Kapha pradhan Vishama jwara

Improper management

Variation in manifestations as per Prakriti of individuals

PITTA Predominant

KAPHA Predominant

VATA Predominant

FIG NO.01: A HYPOTHETICAL MODEL OF COVID-19 DISEASE PROGRESSION IN AYURVEDIC PARLANCE
Fig 01 Legend: Schematic diagram representing CoVID 19 disease progression in Ayurvedic parlance.

Antigen invasion (agantu nidana), is causally linked with dysfunction of host dosha homeostasis that fundamentally affects primary metabolism (agni), manipulates thermoregulation (swedavaha srotorodha) and induces poorvarupa (sickness behaviour). Poorvarupa symptoms cluster is a candidate factor to assess the dysfunctional dosha constitution. If not appropriately intervened, poorvarupa state advances to Jwara. The type and severity of jwara manifested is significantly dependent on prakruti and saara (endurance and tissue homeostasis).
POORVARUPA

MILD TO MODERATE SYMPTOMS

RESOLVING PHASE

FIG NO.02: PROPOSED PERSONALIZED PROTOCOL IN COVID-19 CASES
**Fig 02 Legend:** Schematic diagram representing proposed Ayurvedic personalized prophylactic protocol in CoVID 19 positive cases.

Phase 01 represents the poorvarupa state (Sickness behaviour phase), wherein shamana snehap-ana, virechana and specific shamana oushadha are proposed based on predominant prkruti as a prophylactic measure. Phase 02 represents the onset of symptoms, wherein different types of virechana are proposed. Phase 03 depicts the resolving phase of immune response wherein different bastis and specific rasayanas are highlighted considering a better and a quicker immunomodulation after the viral attack. Shamana oushadha (Internal medicaments) shall be tailored to subjective day to day symptom presentation. Severe cases or cases reporting any complication shall not be considered for Panchakarma therapy.
**Fig 03 Legend**: Schematic diagram representing proposed *Ayurvedic* personalized prophylactic protocol in high to low risk primary contact with a positive case.

Proper *panchakarma* therapy highlighting *virechana*, for preventing the inflammation driven tissue destructive phase of SARS CoV2 induced immune response is highlighted. This is followed by specific *bastis* for initiating immunomodulation as a prophylactic measure.
Identify district level Containment zones/wards (Govt. databases)

Collaboration with community health centres/local bodies/health workers

Household Survey

Primary data collection (Living standards/ Prevalent diseases)

Prakriti assessment at household with structured questionnaires

Based on Prakriti/Agni/Co-morbidities

Prophylactic kit distribution

Monitoring and Evaluating system

Issuing Participant card

Regular follow up/Digital scrutiny for protocol compliance

Impact Analysis

Recording participant response with different tools/ recording incidence of infections with their severity
Fig 04 Legend: Schematic diagram representing the proposed Ayurvedic community level prophylactic protocol – a hypothetical DOTS model.

 Following the DOTS model of therapeutic intervention famous for TB surveillance and treatment, a community level Ayurvedic prophylactic protocol in CoVID 19 is proposed.
Conflict of Interest

The authors declare no conflict of interest related to this paper.