EVALUATION OF DOSHA DUSHTI, SROTO DUSHTI & QUALITY OF LIFE IN LONG COVID-19 SUBJECTS – AN OBSERVATIONAL STUDY

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ABSTRACT

SARS-COV-2 has resulted in a global pandemic and an unprecedented public health crisis. It has infected more than 75 million people worldwide. Clinical features vary from a mild asymptomatic state to a severe state with respiratory dysfunction, thrombotic complication and multi-organ failure. Recent literature suggests the emergence of a novel syndrome known as "Long COVID/Post-COVID-19 Syndrome", a term used to describe a diverse set of symptoms that persist after a diagnosed COVID-infection. Recently, National Institute for Health and Care Excellence(NICE) guidelines effectively defined, 'Post-COVID-19 syndrome' as a persistence of symptoms beyond 12 weeks from the date of onset and are not explained by an alternative diagnosis. Ongoing symptomatic COVID-19 is defined as signs and symptoms that persist between 4 and 12 weeks from the onset of the infection. The term "Long-COVID-19" includes both ongoing symptomatic COVID-19(4-12 weeks) and post-COVID-19 syndromes (>12 weeks). Presentation can vary greatly between individuals, making diagnosis and treatment challenging. Management of patients with 'Long-COVID-19' should include a multidisciplinary team. There is no disease which manifest without undergoing vitiation of dosha. The kupita dosha depending upon the nature of hetu, travels to various parts of the body and produces variety of diseases. Disturbance in dosha leads to sammoorchana with dushya and takes sthanasamsraya which results in disease manifestation. Quality of life assessments are used in broad ranging ways. It rays light on the assessment of disease prognosis. It is quintessential to evaluate dosha and srotas in understanding the samprapti of a disease. Hence the assessment of dosha and sroto dushti and QOL is carried out in Long-COVID-19 subjects to evaluate the extent of involvement, which is further helpful in planning treatment protocols

KEY WORDS: *Dosha-dushti, Sroto-dushti, Long-COVID, QOL*

INTRODUCTION:

Severe acute respiratory syndrome Coronavirus 2(SARS-COV-2), the known causative agent of Coronavirus disease 2019 (COVID-19) which emerged first in Wuhan Province of China has caused catastrophic health, social, and economic crisis worldwide[1, 2]. 3months after the emergency of COVID-19, the WHO declared it as a pandemic[2]. It has become a world-changing event and is not only a humanitarian crisis but also an economic and social crisis[2, 3].

Although respiratory infection is the primary clinical manifestation, covid-19 is considered a multi-organ systemic disease that includes the lungs, heart, vascular system, brain, and other organ systems[4, 5]. Most people who develop COVID-19 fully recover, but current evidence suggests approximately 10–20% of people experience a variety of mid and long-term effects after they recover from their initial illness[6]. Although our current understanding of causes of post COVID-19 condition and why some people are more affected is limited[6].

Patients with ongoing symptoms after recovery from COVID-19 are increasingly recognized as a growing population in need of attention. Post COVID-19 condition, also known as long COVID, refers to long-term symptoms that some people experience after they have had COVID-19. People who experience post COVID-19 condition sometimes refer to themselves as "long-haulers"[6, 7, 8] .

Recent National Institute for Health and Care Excellence(NICE) guidelines effectively defined, 'Post-COVID-19 syndrome' as a persistence of symptoms beyond 12 weeks from the date of onset and are not explained by an alternative diagnosis. Ongoing symptomatic COVID-19 is defined as signs and symptoms that persist between 4 and 12 weeks from the onset of the infection. The term "Long-COVID-19" includes both ongoing symptomatic COVID-19(4-12 weeks) and post-COVID-19 syndromes (>12 weeks)[8,9,10].

Dosha are the one which when increased in their quantity does vitiation of other in the body[11]. Each *dosha* have specific site to reside, yet these *dosha* moves throughout the body. The *kupita dosha* depending upon the nature of *hetu*, travels to various parts of the body and produce many diseases[12]. The vitiated condition of *dosha* makes blockade wherever

there is weakness of the *srotas* leading to *sammoorchana* with *dushyas* and takes *sthanasamshraya* which results in disease manifestation[11]. Experts opine that an individual is just an aggregate of in-numerable *srotas*[13]. *Vata*, *Pitta*, and *Kapha* move all over the body in all the *srotas* serving as their passage[14]. *Srotasam prakrutirbhutavanna vikarairupasrujyate shareeram*- which means as that when srotas are in normal the body is not inflicted with any kind of disorder[15].

The reported prevalence of long COVID has varied across and within many countries: UK 1.6–71%, Germany 35–77%, China 49–76%, Africa 68%, India 22%, Bangladesh 16–46%, Denmark 1%, 29 Italy 5–51%, USA 16–53%[16].

COVID-19 and its post sequel involve not only pulmonary but also other multi-organ system such as Cardiovascular, Renal, Endocrine, Nervous system, Gastrointestinal and so on[5]. So it is quintessential to evaluate *dosha*, and *srotas* in understanding the *samprapti* of a disease. Hence, assessment of *dosha* and *sroto dushti* is studied in long COVID-19 subjects and expressed in this study.

AIMS AND OBJECTIVES

1. To analyse *Dosha dushti*
2. To analyse *Sroto dushti*
3. To assess Quality of Life in Long COVID-19 Subjects

MATERIALS AND METHODS

Diagnostic Criteria:

1. Subjects tested positive for COVID-19 by RT-PCR method.
2. Subjects who presented with signs & symptoms that continued or developed after acute COVID-19 including both ongoing symptomatic COVID-19(from 4-12 weeks) and post COVID-19 syndrome (12 weeks or more).

Inclusion Criteria:

1. Subjects fulfilling the diagnostic criteria.
2. Subjects of irrespective gender of age between 18-70 years.
3. Both vaccinated and non-vaccinated subjects were taken.
4. Subjects willing to give consent to participate in this study were taken.

Exclusion Criteria:

1. Subjects who were not willing to give consent.
2. Age below 18years and above 70 years.

Study Design:

It was an Observational Study.

- Subjects fulfilling the inclusion criteria were selected for the study.
- Case per-forma was prepared which include *dosha dushti, sroto-dushti lakshana* and QOL assessment scale.
- Questionnaire for assessment of *Dosha Dushti* was prepared based on the *dushti lakshana* as mentioned in *Ashtanga-Hridaya Sutrasthana- Doshadivijnaniya-adhyaya.*
- Questionnaire for assessment of *sroto dushti* was prepared based on the *dushti lakshana* as mentioned in *charaka-samhita vimanasthana i.e. Srotovimana* for *prana*, *udaka*, *anna*, *mutra*, *pureesha*, *sweda* and remaining *srotas dushti lakshana* was prepared on *dushti lakshana* as mentioned in *Charaka-sutrasthana-Vividhashitapitiya adhyaya.*
- Questionnaire for QOL was taken by WHOQOL-BREF.
- The obtained data was evaluated and analysed for understanding the extent of involvement of *dosha dushti, sroto dushti*, and QOL.

Assessment criteria:

Subjective criteria:

- Subjects satisfying inclusion criteria were selected and the extent of involvement of *dosha dushti* as well as *sroto dushti* in Long COVID-19 was assessed based on prepared questionnaire.
- Subject were also assessed to know the quality of life using WHOQOL-BREF.

Statistical Analysis:

- Data was entered in MS Excel 2010.
- Statistical analysis was done by using SPSS version 23.
- Descriptive statistical measures like percentage, mean and standard deviation were applied. Data is represented as tables and graphs as per relevant

RESULT:

Dosha Dushti :

Vata dushti

Among 300 subjects in the study 3.3 % subjects had *kampa*, 6% had *brama*, 6.3% subjects had *nidranasha*, 7.7 % subjects had *anaha*, 19.3% subjects had *karshnya*, 19.7% subjects had *shakrt graha*, 24% subjects had *ushnakamita*, 27.6 % subjects had *dainya*, 36.7% subjects had *sleshmavruddhi amaya*, 64% subjects had *angasada*, 65.4% subjects had *karshya*, 73% subjects had *indriya bramsha*, 74.7% subjects had *alpachesta* and 77.3% subjects had *bala bramsha* frequently.

Pitta dushti

Among 300 subjects, 6% had *sheeta*, 10.3% had *prabhahani*, 14.3% had *daha*, 20.7% had *alpanidrata*, and 22% had *kshuth ati-matra* frequently.

Kapha dushti

Among 300 subjects, 0.3% had *shaitya*, 7% had *praseka*, 10% had *shwaitya*, 31% had *swasa*, 35.7% had *gourava*, 53.3% had *alasya*, and 53.3% had *kasa*, frequently.

Sroto-dushti:

Pranavaha sroto-dushti

Among 300 subjects, 0.7 % had *alpa alpa swasa*, 1.3% had *sa shula swasa*, 1.7% had *sa shabda swasa*, 7.7.% had *ati srushta*, 8% had *abhikshna*, 18.3% had *kupita swasa* and 31.3% had *ati baddha* frequently.

Annavaha sroto-dushti

Among 300 subjects, 7.3% had *chardi* frequently, 21.3% had *avipaka*, 32.3% had *anannabhilasha*, and 73% had *arochaka* frequently.

Udakavaha sroto dushti

Among 300 subjects in the study 41% subjects had *kanta-shosha*, 42.7% subjects had *jihwa-sosha*, 43% subjects had *talus-osha* and *oshta-sosha*, and 43.3% subjects had *pipasa* frequently.

Rasavaha sroto dushti –

Among 300 subjects, 2.7% were having *valaya*, 5.0% were having *palitha*, 5.3 % were having *tandra*, 6% were having *tama*, 7% were having *hrullasa*, 7.3% were having *pandu*, 10.3 % were having *asya vairasya* regularly, 15.3 % were having *sada*, 33.7 % were having *gourava*, 34% were having *jwara*, 39.7 % were having *ashraddha* and 71 % were having *angamarda*.

Raktavaha sroto Dushti:

Among 300 subjects in the study, 1% had *vyanga*, 1.7% had *asyapaka*, 2% had *kota*, 3.3% had *pidaka* frequently.

Mamsavaha sroto Dushti:

Among 300 study subjects, it was seen that, 0.7% had *gandamala*, 2.7% had *galashaluka*, 12% had *shundika* and 21.4% had *upajihwika* frequently.

Medovaha sroto dushti :

In study sample 0f 300, 2.3% *vishra-gandha*, 7% had *madhuraasyata*, 9% had *ati stula*,9.7% had *jatilabhava kesha*, 16% had *aloma*, 16.7% had *karapada suptata*, 18.7% had *karapada daha* frequently.

Asthivaha sroto dushti:

In study sample of 300, 1.6% had *vivarnata*, 8% had *danta bheda*, and 21.8% had *asthi bheda shula* frequently.

Majjavaha sroto dushti:

In study sample of 300, 4% had *murcha* and 10.3% had *parva ruk* frequently.

Sukravaha sroto dushti:

In study sample of 300, 1.3% had *aharsha* frequently.

Swedavaha sroto dushti :

In study sample of 300, 0.3% had *paridaha*,1% had *ati slakshnata*,1% had *parushya*,2.7% had *asweda* always, and 28.7% had *atisweda* frequently.

Purishavaha sroto Dushti:

Among 300 subjects, 0.7% had *sa sabdha*, 5.7% had *ati drava*, 6% had *sa shula*, 16% had *kruchrena mala tyaga*, and 18.3% had *ati gratitha* frequently.

Mutravaha Sroto Dushti:

Among 300 subjects**,** *bahala mutra tyaga* was seen frequently *in 10.3%* subjects.

Manovaha Sroto Dushti:

Among 300 subjects in the study 2.7% subjects had *arditaakrutikaranam*, 5.7% subjects had *udarditvam*, 7.3% subjects had *shirashunyata*, 7.7% subjects had *svanakarnyoho*, 8% subjects had *lomaharsha*, 16.3% subjects *swapna darshana*, 21% subjects had *hritgraha*, 24.3% subjects had *shwasaadhikatha*, 29 % subjects had *chakshuroakluta*, and 60% subjects had *unmattha chintana*,

QOL:

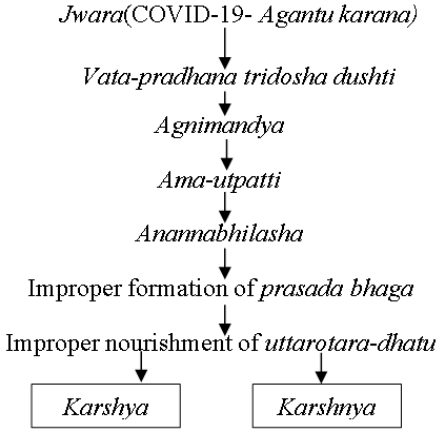
DOMAIN-1:

Among 300 subjects, 89.7% had moderate quality of life and 10% had higher reduction in quality of life regarding the aspects of domain-1

DOMAIN-2:
Among 300 subjects, low reduction of quality of life is seen in 0.7%, 88.7% had moderate reduction, 10.7% had higher reduction, regarding the aspects of domain-2
DOMAIN-3:
Among 300 subjects, 38% subjects had moderate quality of life and 62% had higher quality of life, regarding the aspects of domain-3
DOMAIN-4:
Among 300 subjects, 60.7% had moderate reduction

DISCUSSION ON RESULTS:
Disscussion on *Dosha Dushti*:
1. *Vata Dushti*:
i.*Karshya*:
In this study out of 300 subjects, majority of 192 subjects (65.4%) accounted to weight loss during their recovery phase. The probable mechanism for this is as follows[159, 160]:
i.Affected taste and smell perception
ii.Appetite loss
iii.Fever and feeling unwell
iv.Changes in metabolism – acute systemic inflammation deeply affects several metabolic and hypothalamic pathways contributing to anorexia and decreased food intake as well as elevation of resting energy expenditure and increased muscle catabolism.

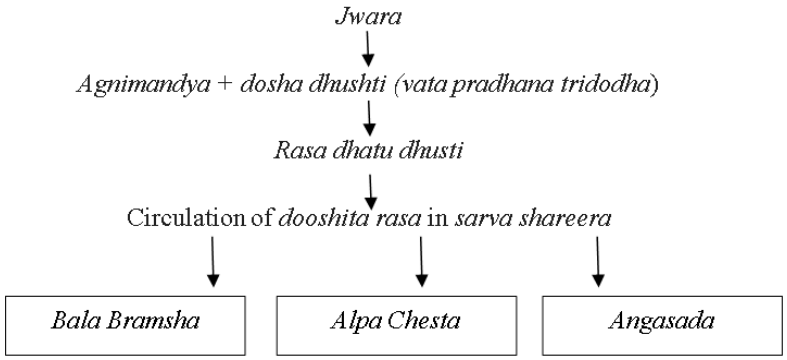
- *karshya* in long covid-19 subjects may be understood in the following way:



It is noteworthy that subjects who lost weight had taken much longer time to recover and some subjects didn't returned to their initial body weight.

ii. ***Bala Bramsha***:
In this study out of 300 subjects, majority of the subjects accounting for 77.3% frequently presented with reduction in their capacity of work. It is been reported as one of the common symptom during the recovery phase of COVID-19. This had last in a subject for more than a period of 3 to 6 months are even more[161].
The probable mechanism: It can be caused by a variety of biological or physical dysfunctions. In addition, other factors that contribute to the development of fatigue in patients with post-COVID-19 such as cytokines released by SARS-CoV-2 infection that impair psychological defence mechanisms, prevalence of pre-existing autoimmune disease and elevated ANA.

This can also be understood as follows:



B. *Pitta- Dushti*:

1. *Kshut*:

Out of 300 subjects, ati-matra kshut pravrutti was seen frequently in 22% of the total sample size. Polyphagia is a disturbance in a normal appetite that present with excessive eating or over-eating.

The probable mechanism[162]:

Pathophysiology of polyphagia is determined by a wide-range of hormones like, Ghrelin, Orexigenic neuropeptides, neuropeptide, gamma-glucocorticoids & agouti-related peptide improve appetite. These pathways are controlled by a complex interplay of the hypothalamus, orbito-frontal cortex, nucleus accumbens and brainstem nuclei.

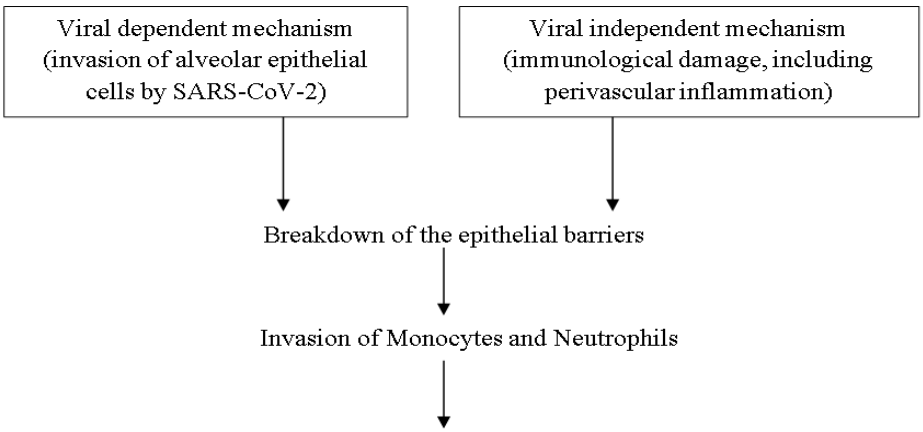
Discussion on *Sroto Dushti*:

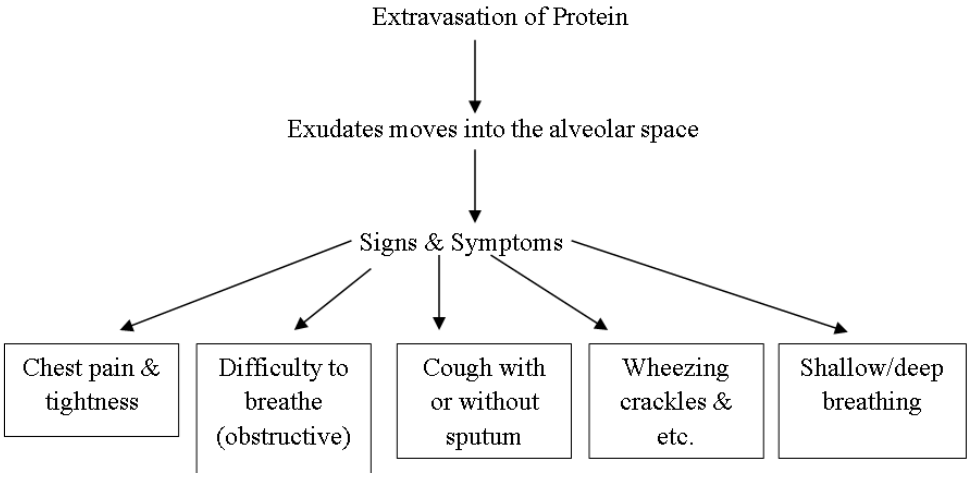
Discussion on *Pranavaha Srotas*:

a. **Patho-physiology of involvement of Respiratory system in LONG-COVID-19:**

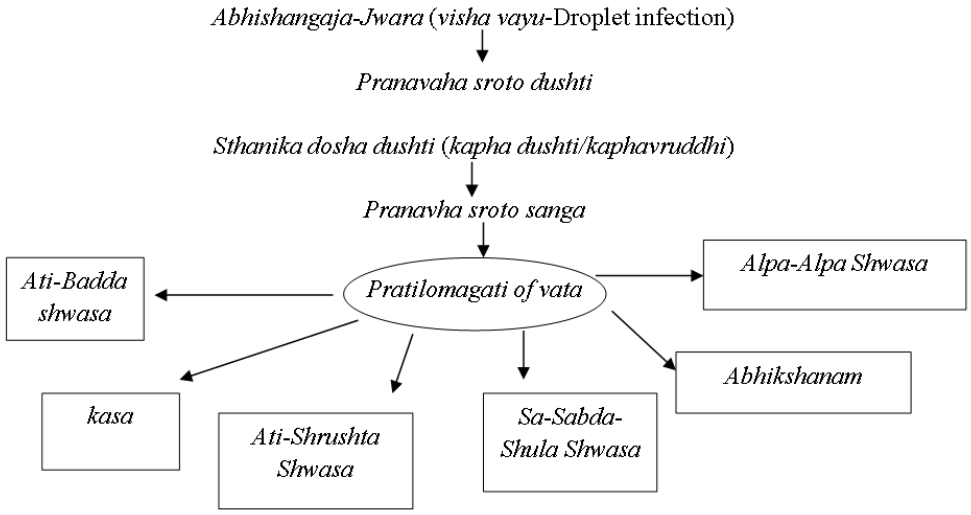
In total study sample the *pranavaha sroto dushti lakshana*, *ati-badda shwasa* was commonly seen in over all study sample accounting for 31.3% followed by occurrence of kupita shwasa in long COVID subjects.

The probable mechanism of above said symptom with relation to Long-COVID-19 is as follows[163]:





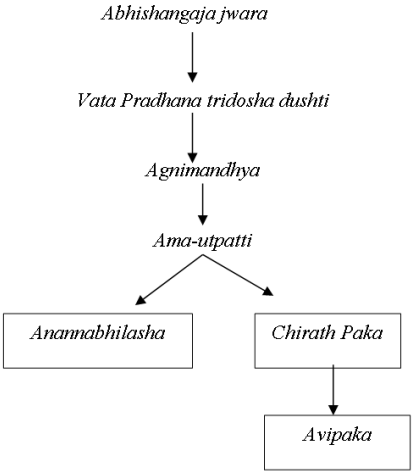
b. We can understand, the same *samprapti* as below,



Discussion on *Annavaha Srotas*:

a. Patho-physiology of involvement of Gastro-Intestinal system in LONG-COVID-19:

- COVID-19 has capacity to alter the gut micro-biome, including enrichment of opportunistic infectious organisms and depletion of beneficial commensals.
- It is been recognised in influenza and other respiratory infections that there is strong evidence of ability of the gut micro-biota to alter the course of respiratory infections through gut-lung-axis[165].
- Possible mechanism can be understood by following ways:



- ***Aruchi***: this *lakshana* can be understood by following way:

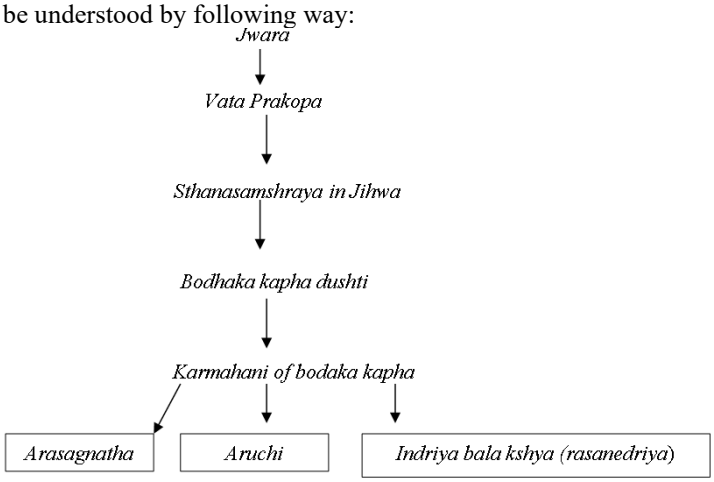
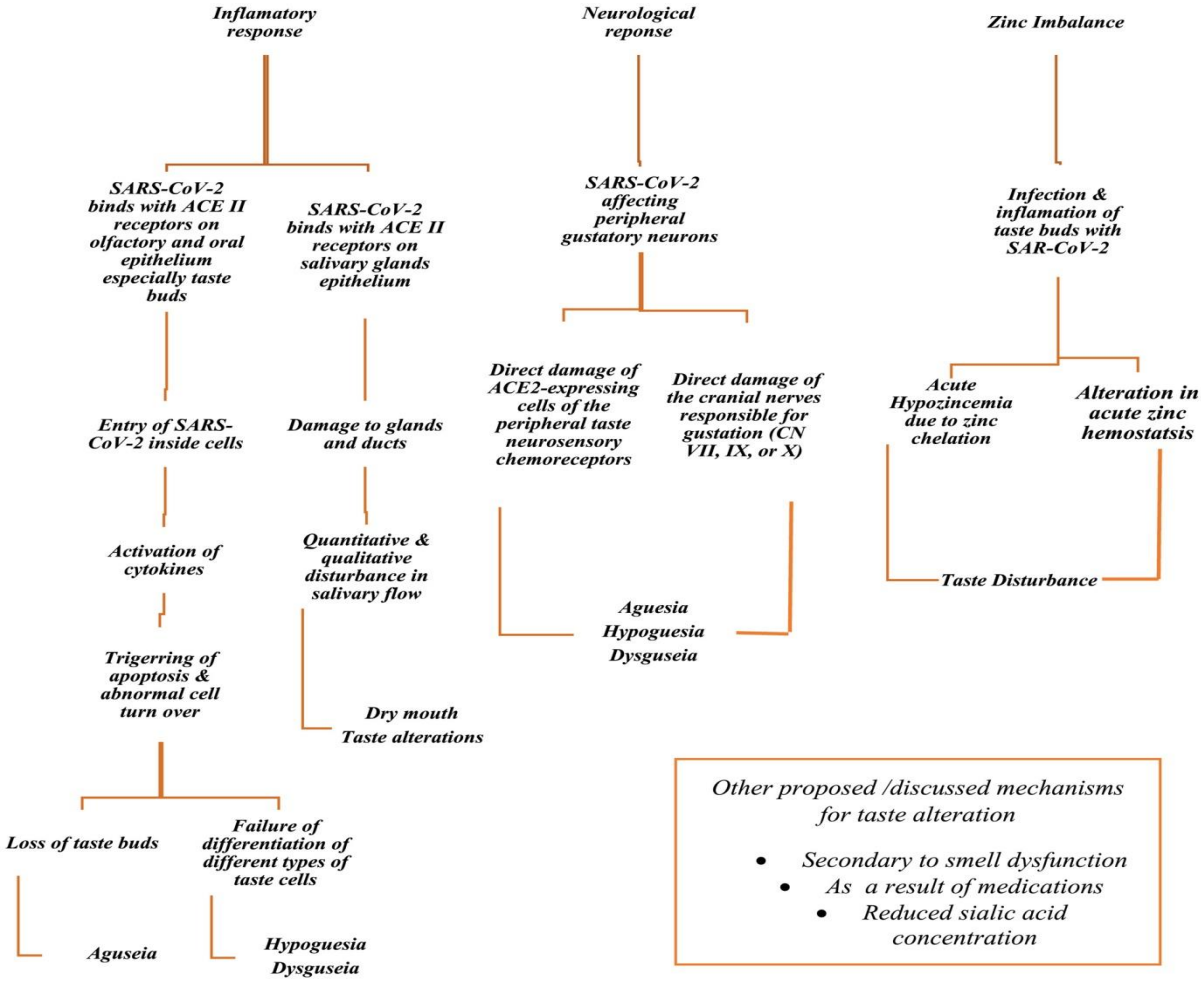
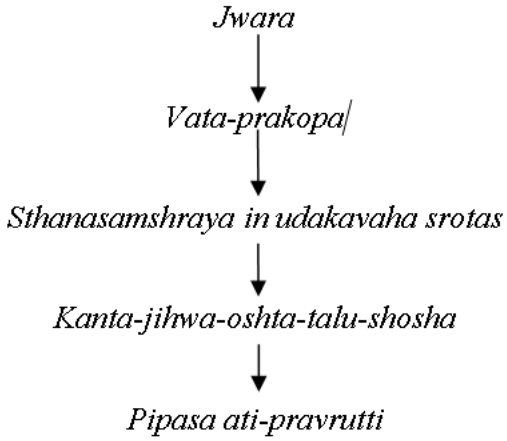


Fig 8: Pathophysiology of manifestation of loss of taste and smell and dryness of mouth



Discussion on *Udakavaha Sroto Dushti:*

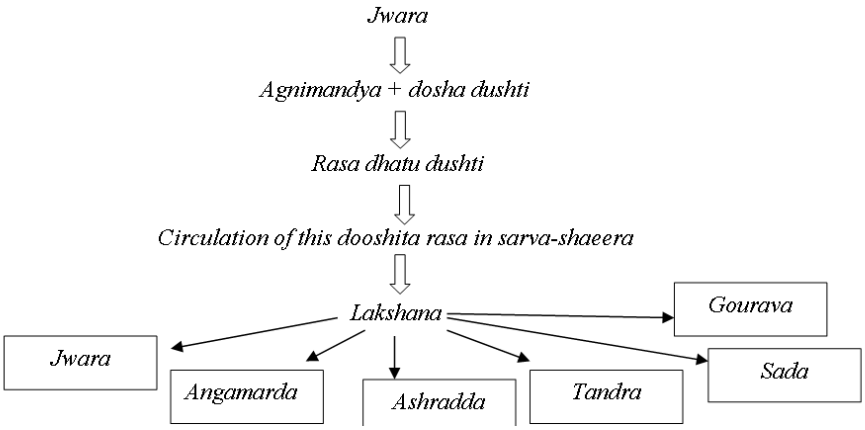
The probable mechanism for the involvemtnt of *udakavaha srotas* is as follows:



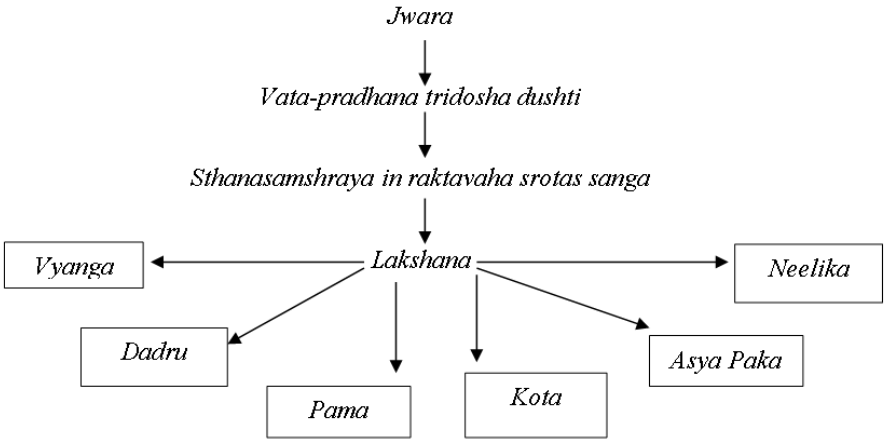
ACE2 exists in various oral mucosal tissues, so, the oral cavity is considered a potential route for SARS-CoV-2 entry. ACE2 receptors are particularly observed in tongue and floor of the mouth, followed by the buccal mucosa and gingival epithelium. The neuropathic and mucotropic effects of this virus can potentially affect the function of salivary glands and lead to hyposalivation and xerostomia.which presents with increased desire for fluid intake[165, 166.]

Discussion on *Rasavaha Sroto Dushti:*
The *rasavaha dushti lakshana* like *ashradha, aruchi, asya-vairasya, arasagnatha, hrullasa* can be understood by the *samprapti* as explained in *annavaha srotas*.

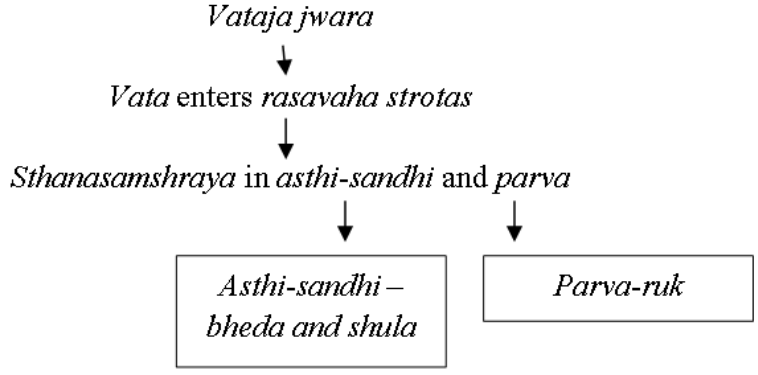
The probable *samprapti* for *rasavaha sroto-dushti* –



Discussion on *Raktavaha Sroto Dushri:*
- The cutaneous manifestations of COVID-19 were not present in all infected subjects. It is found in 58 subjects showing involvement of skin manifestation.
- *Raktavaha sroto dushti lakshana* was seen minimal in overall study sample
- The probable *samprapti* of *raktavaha sroto dushti* **:**



Discussion on *Asthi-Majjavaha Sroto Dushti:*
The probable *samprapti* is:



Discussion on *Shukravaha Sroto Dushti:*

Among the *sukravaha srotas dushti lakshana* few subjects had the symptom of *aharsha* more often and seen in male subject accounting only for 1.3% of the sample.

Pathophysiology[167]: Pathophysiology of Erectile dysfunction includes biological and psychological etiology. Sexual long COVID syndrome, referred to as persisting sexual dysfunction after COVID-19 infection is a concerning problem that may affect the quality of life.

Discussion on *Swedavaha Sroto Dushti:*

Among *swedavaha srotas dushti lakshana*, the majority of the subjects were seen with the symptom of *ati-sweda lakshana* more often accounting for 28.7% during their recovery period. The second most symptoms seen were *asweda* which is seen with equal ratio of always and frequently for varied duration of period followed by *loma-harsha* and other mentioned *dushti lakshana*.

The probable mechanism behind the above said symptoms with respect to Long-COVID-19 is:

Ati-sweda/Hyper-hidrosis[168]:

Directly or via cytokine induced

⇩

Release of prostaglandine2 from endothelial cells

⇩

Acts via paracrine mechanism

⇩

Exacerbate dysfunction

⇩

In medial pre-optic area (containing warm-sensitive neuron)

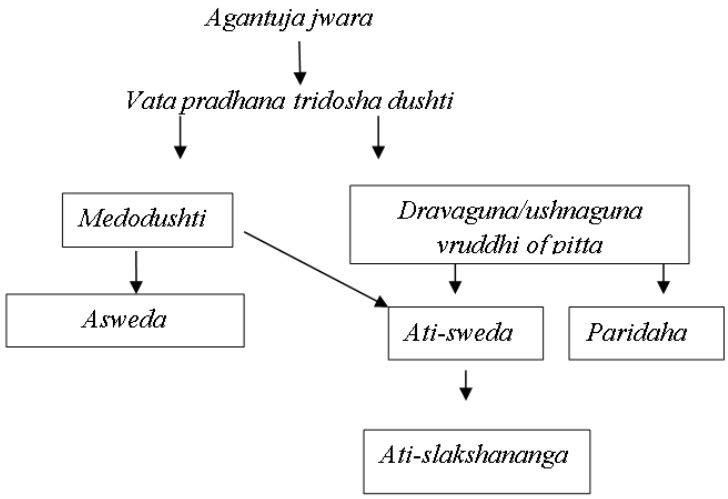
⇩

Triggers sweating

⇩

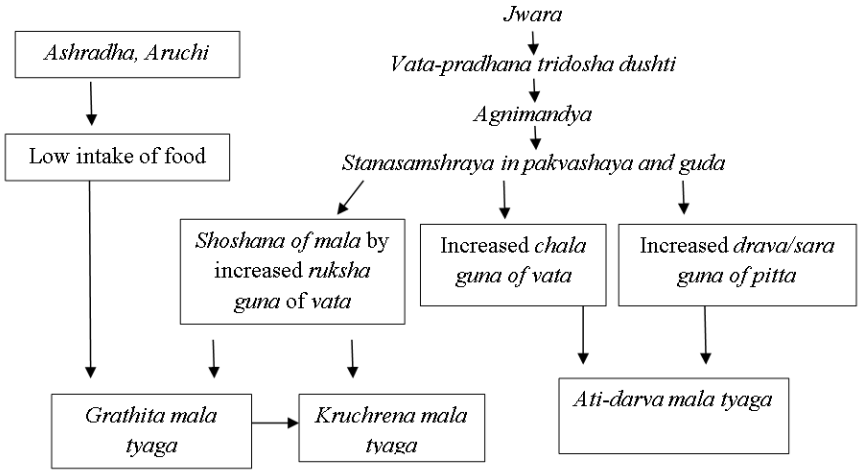
Hyper-hidrosis/*atisweda*

b. *Swedavaha srotas*



Discussion on *Purishavaha Sroto Dushti:*
Among 300 subjects, most of them had difficulty to pass stools and had fragmented type of stools more often accounting 16% and 18% respectively.

The probable mechanism for this:



- Lifestyle changes from isolation due To COVID-19 could cause constipation, due to reduction in physical activity and water intake.[169]
- COVID-19 infection can alter the gut flora thereby leading to alteration in formation of stools and their excretion.

Discussion on *Mutravaha Sroto Dushti:*
- Among the *mutravaha srotas dushti lakshana, bahu-mutrata* is commonly seen in this study.
- The association between covid-19 infection and lower urinary symptoms was still unknown. The most frequent complaints of lower urinary tract symptoms were frequency.
- Mechanism[170]:

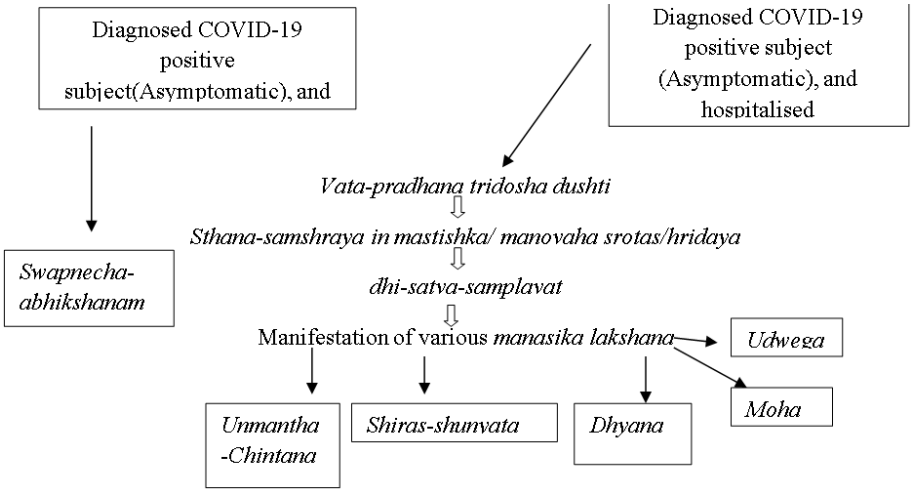
1. Through direct replication of SARS-cov-2 in the urinary tract
2. Due to local and systemic inflammation

Discussion on *Manovaha-Sroto-Dushti*:
The symptom of *manovaha sroto dushti lakshana* can be interpreted by classifying in following ways:
a. *Daihika*
b. Manasika
Likewise Nervous system manifestation can be classified as:
1. Central Nervous system
2. Peripheral Nervous system
Or
1. Psychological
2. Neuronal

While recovery from COVID-19 one may have varied range of emotions. These may include feeling depressed, tired, anxious or tearful.

The mechanisms involved in the manifestation of neuropsychiatric symptoms include[171]:
1. Direct viral infection
2. Severe systemic inflammation
3. Neuroinflammation
4. Microvascular thrombosis

5. Neuro-degeneration
6. Dysfunctional lymphatic drainage from circum-ventricular organs, as well as viral invasion in the extracellular spaces of olfactory epithelium and passive diffusion and axonal transport through the olfactory complex.



DISCUSSION ON QUALITY OF LIFE:

1. DOMAIN-1/physical health[144];

Domain-1 includes activities of daily living, dependence of medicinal substances and medical aids, energy and fatigue, mobility, pain and discomfort, sleep and rest, and work capacity.

In this study there was moderate reduction in energy, mobility, sleeps, work capacity, dependence of medicinal substance and aids, and so with the daily living activities whereas remaining 10.3% had them highly.

Bala-bramsha, alpachesta, anagamarda, alasya had impact on the quality of life in long-COVID-19 subjects.

2. DOMAIN-2/ Psychological[144]

This part of QOL includes acceptance of bodily appearance, negative feelings, positive feelings, self esteem, spirituality/religion/personal-beliefs, thinking, learning, memory, and concentration.

In this study 88.7% had moderately reduced self-esteem; accept themselves, negative feeling, and concentration, memory, learning and thinking capacity. 10.7% highly reduction of memory and concentration, and had recurrent negative feelings, and low esteem. Only 0.7% had low negative feelings and mild reduction in the memory and concentration. This indicates there was moderately reduction of self-esteem, memory, concentration and etc., after COVID-19.

Unmantha-chinthana, moha, udwega had impact on the quality of life in Long-COVID-19 subjects.

3. DOMAIN-3/Social relationship[144]

This part of QOL includes personal relationships, social support, and sexual activity. In this study, 38% were moderately got support from their family and social. Remaining 62% had less support from family and social.

4. DOMAIN-4/ Environment[144]

This includes financial resources, freedom, physical safety, health, transport, home environment, physical environment (pollution/ noise/ traffic/ climate), participation in and opportunities for recreation/ leisure activities, opportunities for acquiring new information and skills. In this study, 60.7% had moderate reduction of above mentioned factors whereas, 39.3% had highly.

This shows that financial resource, physical safety, health has much moderately altered lately with respect to COVID-19.

CONCLUSION:

On analysis in Long COVID-19 subjects, *vata dushti* predominates with *karshya, bala-bramsha, indriya-bramsha, angasada, alpachesta*,

On analysis in Long COVID-19 subjects, *rasavaha sroto dushti* predominates with *aruchi*, *ashradha*, *angamarda*, *jwara*, *arasgnata, gourava, sada.*

On analysis with QOL in Long COVID-19 subjects, there was moderate reduction in all the domains of the WHOQOL-BREF parameters.

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