

Possible Measures to Assess Functional States of Tridosha: A Critical Review

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ABSTRACT

Healthy and unhealthy state of a human being depends on normal and abnormal functional state of *Tridosha*, considering the physiological importance of *Dosha* in maintenance of homeostasis of the body *Tridosha* have been called as root (*Dosha Dhatu Mala Moolam hi Shariram*) of the body. All the functions of the body could be explained in terms of *Dosha*, *Dhatu* and *Mala*.

Tridosha are the biological entities derived from *Panchamahabhuta*, responsible for regulation of all bodily functions and its regulation. Variation in functional state of *Tridosha* with respect to age, day-night, and season occurs to accommodate body with the environmental influences like sunrise, sunset and seasonal variations. Ayurveda has described three dynamic states of *Tridosha*, namely *Sama* (balanced state), *Kshaya* (hypo functional state) and *Vridhhi* (hyper functional) state/ state of excess accumulation. These states of *Dosha* could be assessed by observing the sign and symptoms produced in body by altered state of *Dosha*.

This paper is aimed to summarize and analyze the descriptions regarding the hypo and hyper functional states of *Tridosha* (*Dosha Kshya-Vridhhi*) made by Ayurvedic scholars and suggest some objective parameters to assess the functional state of *Tridosha*.

Keywords: *Dosha*, *Dosha kshaya*, *Dosha vridhhi*, *Dhatu*.

INTRODUCTION

Ayurveda has considered that the balanced state of *Dosha*, *Dhatu* and *Mala* leads to state of health and their imbalanced state produces disease. [1] This state of equilibrium is maintained through not only the definite quantity but also quality (functional state) of these factors i.e. *Dosha Dhatu* and *Mala*. [2] The state of health has been defined as the presence of equilibrium in activities of *Dosha*, *Agni*, *Dhatu*, *Mala* and calm and pleasant state of soul, sense organ and mind. [3] The state of health is maintained until and unless these factors are in equilibrium but results in diseases when there is any discordance in them (*Vaishmaya*). [1] (Ch.su.9/4) *Tridosha* are the biological entities derived from

Panchamahabhuta, responsible for regulation of all bodily functions. Both quantitative and qualitative criteria have been mentioned for describing the functional status of *Dosha*, *Dhatu* and *Mala*. Quantitative assessment is done by *Anjali Pramana* and qualitative assessment through the observing their functions.

Quantitative assessment: No quantitative measurement has been described for assessment of *Kshaya* and *Vridhhi* of *Dosha*. Acharya Sushruta in *Dosha Dhatu Mala Kshaya Vridhhi Vigyaniyaya Adhyayaa* has mentioned that quantity of *Dosha*, *Dhatu* and *Mala* couldn't be given due to two reasons i.e. *Vailakshayata* (individual variations due to different *Prakriti*, *Sara* and *Sahanana*) and

Asthiravata (due to variation as per day, night, age and season).^[4] Although the Charaka has mentioned quantity (*Anjali Pramana*) of *Pitta* and *Kapha Dosha* as five and six *Anjali* respectively but no *Anjali Pramana* has been mentioned for *Vata Dosha*.^[5] Practically quantitative assessment of *Dosha* is not possible, and thus more emphasis has been given on qualitative assessment.

Qualitative Assessment: To assess the functional state of *Dosha* the qualitative assessment is advised, that is to observe the given characteristics in different functional state of *Dosha*. Qualitative assessment is done for both balanced and imbalanced state of *Dosha*. Balanced state is assessed by observing distinct properties and functions which have been ascribed to each *Dosha* and inherent proportion of *Dosha* which is present since birth i.e. *Prakriti*. The imbalanced state of *Dosha* is assessed for making proper diagnosis, pathogenesis and treatment plan through observing the different proportion of *Dosha* in diseases. In state of *Doshakshya* the normal functions are found diminished while in state of *Dosha Vriddhi* augmented functions are observed.^[6]

For instance, *Vata* contributes to manifestation of shape, cell division, signaling, movement, excretion of wastes, cognition and also regulates the activities of *Kapha* and *Pitta*. *Kapha* is responsible for anabolism, growth and maintenance of structure, storage and stability. *Pitta* is primarily responsible for metabolism, thermo-regulation, energy homeostasis, pigmentation, vision, and host surveillance.^[7,8]

Qualitative measurement of Tridosha through assessment of Prakriti:

Prakriti or Psychosomatic constitution of an individual is determined through the different proportion of *Tridosha* which is inherent from birth itself. Acharya Charaka has described that *Dosha Vriddhi* is of three categories mild (*Heena*), moderate (*Madhyam*) and severe (*Pravara*).^[6] (The *Dosha Vriddhi* of moderate and severe

category produces disease. The *Dosha* dominant in psychosomatic constitution is of mild category, do not produce any disorders but only make the individual susceptible for the disease of *Dosha* which is dominant in *Prakriti*. The assessment of proportions of inherent *Dosha* (*Doshaansha*) in *Prakriti* is done by observing the morphological, physiological and psychological traits described for each *Doshaja Prakriti*.

Now various research studies have been attempted to specify biochemical, hematological and genetic basis of constitutional types described in Ayurveda. Difference in various biochemical parameter and hematological parameters have been found in different psychosomatic constitutions and thus are responsible for different disease predisposition and can help to uncover genes that may contribute to system level differences in individuals.^[9,10] extensive metabolizer genotype is found to be associated with *Pitta Prakriti* while poor metabolizer genotype in *Kapha Prakriti* which is concurrent with the description of Ayurveda that *Pitta Prakriti* individuals are having *Teekshagni* and *Kapha Prakriti* are having *Mandagni*.^[11]

Variation in functional status of Dosha:

Even in the physiological condition, there is some discordance or *Kshaya Vriddhi* occurs naturally in these biological factors i.e. *Dosha*, *Dhatu*, *Mala*, which is not harmful because they do not produce any disease.^[2] When this *Kshaya Vriddhi* will exceed beyond the physiological limit, disease will be produced. While describing the *Anjali Pramana* (measurements) of the body elements, *Acharya Charaka* has mentioned that these quantities can undergo variation in the form of increase (*Vriddhi*) or decrease (*Kshaya*) in healthy individuals too.^[5]

Dosha accumulation beyond physiological limit always lead to disorders. Degree of their accumulation can be measured with the expressions shown on body functions. *Dosha* when aggravated manifest their sign and symptoms in

accordance with degree of aggravation, *Dosha* in state of *Kshaya* give up their normal execution and those in a state of equilibrium carry out their normal functions. [2]

MATERIALS & METHODS

A comprehensive study was done on descriptions related to different functional state of *Tridosha*, its characteristics of *Kshaya* and *Vridhhi* and measures to assess the different functional state of *Tridosha*. Descriptions were collected from various Ayurvedic Samhita and recent research papers related to it were searched online from scientific sites viz. Pubmed, Google scholar, web of science by using keywords like *Dosha* biorhythm, *Dosha Kshaya* and *Vridhhi*. The findings were analyzed in view of modern physiology and research to understand changes in functional state of *Dosha* and measures to assess it.

REVIEW AND DISCUSSION

Various functional States of *Dosha*:

Whole body is abode of three *Dosha*, which brings about good and bad results according to their normal and abnormal state. [12] There are two aspects of *Dosha* i.e. *Prakriti* (natural) and *Vaikrit* (morbid). [13] In normal state they are responsible for the growth, strength, and good complexion but on abnormalcy, results in various type of diseases. [12] Again three types of *Dosha Gati* or *Doshavastha* have been mentioned i.e. *Kshaya*, *Sthana* and *Vridhhi*. [14] In other words, *Dosha* have two states, *Samya* and *Vaishamaya*. *Vaishamaya* is of two types *Kshaya* and *Vridhhi*, and *Vridhhi* is again of two types *Chaya* and *Prakopa*. And thus there are four states (Avastha) of *Dosha* i.e. *Samya*, *Kshya*, *Chaya* and *Prakopa*. [15]

Sama: Normalcy of *Dosha* in their respective sites and non-manifestation of diseases. [16]

Chaya: Increase of *Dosha* in their own sites which produces dislikes for the causative factors and liking for the factors having

opposite qualities. [17] Dalhan has named it as *Sahantirupa Vridhhi Chaya* [18]

Prakopa: The aggravated *Dosha* spreads to different parts of the body, causes appearance of their own features, feeling of ill health, and occurrence of premonitory symptoms and manifestation of diseases. [16] Dalhna has described it as *Vilayanarupa Vridhhi*. [18] Thus for treatment of disease, state of *Dosha*, causes of vitiation, sites etc. should be determined. [19]

Physiological rhythmic variation in functional state of *Dosha*: A physiological variation in activities of *Dosha* occurs in relation with age, day and night, during digestion [20] and season [21] but when this *Kshaya Vridhhi* will exceed beyond the physiological limit, disease will be produced. Description related to physiological variations in bodily functions and cellular mechanisms have been also mentioned in circadian and quotidian rhythm. All biophysical and biochemical parameters like heart rate, blood pressure, WBCs, hormones show the physiological state of the body which also varies as per age, level of physical activity, climatic changes, after meal intake. The similar description has been mentioned in Ayurveda in relation to *Vata*, *Pitta* and *Kapha* i.e. *Tridosha* which are responsible for all physiological and biochemical changes. [22]

Mechanism of action of *Tridosha Guna* in state of altered physiological state--

Types of hypo and hyper functional states of *Dosha*: 62 permutation of combination of *Dosha* manifest due to combination of three *Dosha* in different proportion to each other. For example one *Dosha* excessively aggravated while other two aggravated or vice versa, or these three *Dosha* are increased progressively, two *Dosha* may be increased while one is diminished, one *Dosha* may increase, one diminished while another is normal, or the three *Dosha* are increased separately. [23] As the properties of *Dosha* are mutually contradictory to each other, on combination may cause destruction to each other but due to their natural power of coexistence they do not

destroy each other in spite of mutually contradictory qualities, just like the dangerous poison in body of snake does not kill it. [24] Hormones, enzymes or neurotransmitters acting in body do not have similar functions, somewhat are having opposite functions to each other for example insulin decreases the blood glucose level while glucagon decreases blood glucose level by stimulating or inhibiting different sets of enzymes, on deficiency of insulin the secretion of glucagon is relatively decreased due to sustained increased level of blood glucose. The hypersecretion of growth hormones or glucocorticoids causes increased insulin resistant in spite of increased insulin production. [25]

In state of *Vata Kshaya* (hypo functioning of *Vata Dosha*), characteristics of *Kapha Vriddhi* (hyper functioning of *Kapha dosha*) are produced. This relative increase in features of *Kapha Dosha* are found due to decrease in functioning of *Vata Dosha*. The hypo or hyper functioning of *Dosha* may be independent to each other or relative to each other. This relationship of functioning of *Dosha* can be explained through the various feedback mechanism of hormonal and neurotransmitter interaction taking place in body for example in Parkinsonism, due to degeneration of nigrostriatal neurons in the basal ganglion results in dopamine deficiency leads to imbalance between the activity of inhibitory Dopaminergic neuron and excitatory cholinergic neuron, and produces enhanced function of cholinergic neurons. [26]

Independent feedback mechanism: *Dosha* also show the independent feedback mechanism in their functioning. As the properties of *Dosha* are mutually contradictory to each other, on combination may cause destruction to each other but due to their natural power of coexistence they do not destroy each other in spite of mutually contradictory qualities, just like the dangerous poison in body of snake does not kill it. [24] Mutually contradictory properties exists in *Panchbhautika Dravya* without nullifying each other for example *Jala* and

Agni Mahabhuta do resides in same *Dravya* without nullifying each other and producing *Amla Rasa*. Indian Gooseberry (*Embelica ribes*) possess five *Rasa*, and pacifies *Dosha* through different *Guna* i.e. *Amla Rasa* alleviates *Vata Dosha*, *Madhura* and *Sheeta* alleviates *Pitta Dosha*, *Katu - Tikta Rasa* alleviates *Kapha Dosha* but *Amla Rasa* does not destroy *Vata Dosha* with *Kashaya* and *Sheeta Guna*, *Madhura* and *Sheeta* doesn't destroy *Pitta* having *Amla Rasa*. (Chakrapani on Ch.Su.17/62) Modern physiology also describes the similar phenomenon as in case of hormonal secretions, which are independently controlled through their releasing and inhibitory factors. Although it is also mediated through certain circulatory factors for example secretion of Growth hormone is controlled through releasing and inhibitory factors from hypothalamus. The level of growth hormone is also controlled through circulatory factors like blood level of glucose, amino acid, fatty acid, ghrelin, testosterone and conditions like trauma, stress, excitement, starvation and fasting enhances the release of growth hormone. But the increased level of glucose, free fatty acid, somatomedin, and conditions like obesity and aging, decreases the secretion of growth hormones. The factor influencing the secretion of one hormone will not have necessarily same effect on production of other hormones. [25]

Causes of hypo and hyper functioning of *Dosha*:

1. *Trividha Karana*: *Doshas* are increased due to improper association of sensory object with respective sense organ, *Kala* (time, season) and *Karma* (action). Each of this is of three types, *Hina* (inadequate), *Mithya* (improper) and *Ati* (excess). [27]
2. Factors causing Aggravation of *Dosha*: Each *Dosha* get aggravated by overindulgence in diet and activities which are having similar properties to them. Indulgence in attributes having similar or dissimilar properties to *Dosha*: Properties similar to *Dosha*

results in increase while dissimilar properties results in decrease. [28,29] Like indulgence in substances having properties opposite of *Guru*, *Sheeta*, *Mridu*, *Snigdha*, *Madhura*, *Sthira*,

Pichhila results in *Prashama* (pacification) of *Kapha* [30] same should be understand for *Pitta* and *Vata* also. (Table 1) [31-34]

	Rasa (Taste) and qualities of food	Eating behaviors	Behaviors	Physical activities	Psychological attributes
<i>Vata Dosh</i>	<i>Katu</i> (pungent), <i>Tikta</i> (bitter), <i>Kashaya</i> (Astringent) <i>Rasa</i> , dry, light, cold in potency for example dry leafy vegetables and meat, pulses	Fasting, taking food at improper time	Suppressing the urges of flatus, urine, feces, semen, vomiting, sneezing, belching and tears	Indulgence in over physical activity like fighting with stronger person or animal.	Excessive anxiety, fear, grief
<i>Pitta Dosh</i>	<i>Katu</i> (Pungent), <i>Amla</i> (sour), <i>Lavana</i> (salt). <i>Ushna</i> , <i>Teekshna</i> and food which are light in digestion	Fasting, ingestion of food which causes burning sensation inside abdomen during digestion.	Over copulation		Anger, grief, fear
<i>Kapha Dosh</i>	<i>Madhura</i> (sweet), <i>Amla</i> (sour), <i>Lavana</i> (salt), Cold unctuous and guru (heavy), <i>Pichhila</i> (slimy), <i>Abhisyandi</i> (food producing blockage in channels). Eg. Cereals, curd, milk, <i>Krishara</i> , <i>Payasa</i> , product of sugarcane juice, meat and fat of animals of marshy region		Overeating	Day sleep, absence of physical activity, lassitude.	

- Effect of therapeutic procedures: Therapeutic procedures specifically, *Vamana* (Emesis), *Virechana* (Purgation) and *Basti* (Enema) alleviates *Kapha*, *Pitta* and *Vata* respectively. [35] *Snehana* or oilation therapy alleviates *Vata Dosh*. [36] *Raktamokshana* (bloodletting) through *Shring*, *Jaloka* and *Alaabu* alleviates *Vata*, *Pitta* and *Kapha Raktaja Vikara* respectively. [37] Above mentioned conditions are therapeutic and maintains the normalcy but when used improperly (i.e. improper drug, time), instead of pacifying the aggravated *Dosha* results in aggravation of *Dosha*, for example excess (*Atiyoga*) of *Vamana* and *Virechana* causes aggravation of *Vata Dosh*. [38] Excessive bloodletting too leads to aggravation of *Vata Dosh*. [39]
- State of *Agni*: *Agni* is one of the important factor maintaining the normal status of *Dosha*, *Dhatu* and *Mala*. *Agni* and *Dosha* are interdependent to each other i.e. status of *Dosha* effects *Agni* and *Agni* also effects the functional status of *Dosha*. *Vata*, *Pitta* and *Kapha* brings about *Vishamagni*, *Teekshagni* and *Mandagni* respectively. [40] Status of *Agni* is responsible for *Shaman* and

Prakopa of *Dosha* (*Sham Prakopo Doshaanam Sarveshaam Agnisansrito*) [41] or aggravation and alleviation of diseases, that's why in some disease conditions like *Arsha*, *Atisara* and *Grahani* the subject is advised to give special care for the maintenances of *Agni*. [42]

- Role of *Srotas*: *Kshya vridhhi* of all body substances are carried out through *Srotas*, thus the functional state of *Dosha* is also depends on status of *srotas*, All sorts of phenomenon taking place in body are because of *Srotas* only. [43]

Features of hypo functioning of *Dosha*:

The diminution in *Vata*, *Pitta* and *Kapha* is indicated by decrease in their respective normal functions or increase of their opposite functions. For example in hypo functioning of *Vata*, there will be deficient enthusiasm, hypo functioning of *Pitta* will result in indigestion, lack of appetite etc. [44] The diminished *Dosha* will not vitiate the *Dhatu* to produce illness, they just cease to manifest their normal functions. [6] This hypo functional state of *Dosha* could be understood as the manifestations resulting from decreased secretion of endocrine hormones shows diminished action of that

hormone. Deficiency in normal action of *Dosha* will not necessarily lead to aggravation of opposite action for example if enthusiasm goes down, it doesn't mean that grief would necessarily be in excess. The aggravation or diminution of one action will not always lead to diminution or aggravation of other *Dosha*.

Features of hyper functioning of *Dosha*:

Dosha when gets aggravated produces sign and symptoms in accordance with their degree of aggravation. [6] It is a well-known fact that degree of manifestations of sign and symptoms of any disease is directly related to its severity. For example sign and symptoms of anemia depends upon its severity. Aggravation of *Dosha* is invariably indicated by something in excess of respective normal action. [45]

Mechanism of *Dhatu Kshaya vridhhi* by *Dosha*:

The aggravated *Dosha* brings about decrease or diminution of the *Dhatu* by their own strength i.e. *Pitta Dosha* causes *Kshapana* due to its *Katu* and *Ushna* property, *Vata* through *Shoshana Karma* and *Kapha* through obstruction of channels (*Margaavoradha*) in the similar way as fire when augmented evaporates the water in the pot by its own power. [46] This mechanism could be explained through the hormonal action like thyroid hormone, glucocorticoids etc., when secreted in excess causes increased catabolic activities and thus decreasing the strength of the body. The *Dosha* when gets vitiated (undergoes abnormal increase or decrease) causes vitiation of *Rassadi Dhatu* together and vitiates *mala* and in turn it vitiates the *Malayana*. [47]

Assessment of functions of *Vata Dosha* by different parameters:

Vata in normal state carries out functions like enthusiasm, inspiration expiration, movements, and normal metabolic transformation of tissue and proper elimination of excreta. [48] It is also responsible for proper functioning and coordination of sensory and motor organs [49] These functions can be assessed through certain parameters like

Uchhasvas & Nihashvas- RR, Spirometry for assessing different pulmonary function test.

Chesta- Reflexes, Muscle power, Muscle tone, Body parts movements/minute

Vegapravartana- Excretion of urine and stool in normal quantity and in appropriate time (Urge for defecation and micturition and their voluntarily excretion)

Measures to assess functional state of *Vata Dosha* [50]

1. Higher functions, Consciousness (state of awareness of one's self and environment), emotional state, orientation in place and time, delusion and hallucination.
2. Motor system- muscle tone, Power (lower range of normal power), reflexes, gait, coordination of muscular activity (finger-to-nose test, heel -to- shin test, rapid alternating movement)
3. Sensory system: clinical testing of general sensation like touch (light touch, touch localization, two point discrimination), proprioception, pain, temperature.
4. ANS test: cold pressure test, hand grip test, Valsalva maneuver.

Characteristics of Hypo functioning of *Vata Dosha* [51-53]

Praseka	~excessive salivation
Aruchi	~ anorexia
Hrillasa	~ nausea
Sangyamoha/mudhsangyata	~ loss of consciousness
Alpavakachesta	~ loss of speech and physical activity
Apraharsha	~lack of happiness
Angsada	~debility
Agnivaishamaya	~disorders of digestive activity
Shleshmavridhdhalakshana	~ features of <i>Kapha Vridhhi</i>
Bhasitehitam	~loss of speech and physical activity.

1. *Manda Cheshta* (diminished movements)-

Upper(lesion in cranial nerve) and lower motor neuron lesions(poliomyelitis, trauma in peripheral nerve), Parkinson disease, paraplegia, hemiplegia etc.

2. *Alpha vakatvam*: (diminished speech):

Motor Aphasia, dysarthria, temporal lobe syndrome, brain injury.

3. **Apraharsa:** (lack of contentment/emotional instability) - frontal lobe syndrome

4. **Mudha sangyata:** (sensory perception disorders) -Parietal cortical lesions. [54]

Hyper functioning of Vata Dosha: Ayurveda has conceived that any kind of

pain produced in body is due to *Vata Dosha*. Different type of pain sensation has been described in hyper functional state of *Vata Dosha*, which is very similar to the description of modern science regarding the various characters of pain depending upon pathology. [55-59]

<i>Sransa</i>	~to fall, droop , fall down , get loose from
<i>Vyaasa</i>	~severing, separation, division
<i>Vyadha</i>	~to pierce
<i>Swapa</i>	~loss of sensation
<i>Saada</i>	~weakness
<i>Ruka</i>	~pain
<i>Toda</i>	~pricking pain
<i>Bheda</i>	~splitting pain
<i>Angabhanga</i>	~crushing pain
<i>Sankocha</i>	~contraction
<i>Varta</i>	~twisting pain
<i>Asthishula</i>	~pain in bones
<i>Harshana</i>	~tingling sensation
<i>Tarshana</i>	~thirst
<i>Kampa</i>	~tremors
<i>Parushya</i>	~roughness
<i>Soshirya</i>	~cavitation
<i>Shosha</i>	~dryness
<i>Spandana</i>	~pulsation
<i>Veshthanam</i>	~convulsion
<i>Stambha</i>	~stiffness, rigidity, obstruction
<i>Kashayarasta</i>	~astringent taste
<i>Vyatha</i>	~sorrowful or unhappy
<i>Shyaava arunavarna</i>	~blue or crimson discoloration
<i>Karshya</i>	~emaciation
<i>Karshnya</i>	~blackish discoloration
<i>Ushnakamatva</i>	~desire of hot things
<i>Kampa</i>	~trembling/ tremor/ shaking
<i>Balanidraindriyabhransha</i>	Diminished <i>Bala</i> , sleep and functions of sensory and motor organs.
<i>Aanaha/ Gadhavarchastva/ Malasanga</i>	~constipation
<i>Alpabala</i>	~lack of strength
<i>Pralapa</i>	~delirium
<i>Bhrama</i>	~fainting
<i>Deenata</i>	~distress , weakness
<i>Gatrasphuran</i>	~ throbbing sensation in limbs
<i>Sangyanaasha</i>	~loss of consciousness
<i>Majjashosha</i>	~decrease in bone marrow
<i>Aadhmaan</i>	~flatulence
<i>Aatopa</i>	~gurgling noise
<i>Moha</i>	~delusion
<i>Dainya</i>	~depression
<i>Bhaya</i>	~fear
<i>Shoka</i>	~grief

Disorders associated with features of hyper function (Vridhhi) of Vata Dosha [60-62]

1. *Vaka Parushyam* (hoarseness of voice)- Irritation or injury to vocal cord due to Laryngitis, trauma.
2. *Karsya* (Emaciation)- Anorexia nervosa, Starvation.
3. *Karshnya* (hyper pigmentation of the body) – ACTH dependent Cushing syndrome, primary hypoadrenalism.

4. *Ushna kamita* (desire for warmth) - Hypothermia, Hypoglycaemia, Hypothyroidism.
5. *Gatra sphuran, Kampa* (twitching/convulsion, tremors) – Tics (non-rhythmic stereotyped motor movements), Anxiety, nervousness, cerebellar diseases, Wilson diseases.
6. *Nidra nasha* (Insomnia) – in Old age (physiological) – Anxiety, Irritable bowel syndrome, Stress, Arthritis
8. *Gadha Varchasvam* (constipation) - Old age, Bad dietary habits, Drug induced-

opium, cannabis, iron, IBS, intestinal obstruction

Assessment parameters for different functions of Pitta Dosha: Pitta being in normal state is responsible for good vision, good digestion, normal temperature, normal hunger, normal thirst, bodily softness, luster, happiness and intelligence. [63, 64]

Measures to assess the functional state of Pitta Dosha-

1. Visual acuity for distant and near vision, color vision, field of vision.
2. BMR, core body temperature
3. Hemoglobin, total iron binding capacity
4. Skin color by derma spectrophotometer and RGB, Dryness of skin by Trans-epidermal water loss (TEWL).
5. Biochemical analysis: - Analysis of different kinds of digestive enzymes, hormone and other secretion like bile, Gastrin, CCK, Secretin, Pancreatic enzymes etc. to assess *Pachakagni*. All enzymes involved in Krebs cycle may be analyzed to assess the *Dhatvagni* responsible for metabolism at tissue level, LFT for the assessment of *Bhutagni*. Assessing *Agni Bala* and *Jaran Shakti* (ability to bear hunger, frequency and quantity of meal intake and digestive capacity) by using *Agni* Assessment questionnaire. [65]
6. Hormonal analysis – can be done to assess the functional status of *Dhatvaagni* and *Bhutagni*. Increased or decreased in concentration of hormones can be considered hyper and hypo functioning of that *Dhatvagni*. Hormones can be categorized to different *Dhatvagni* group depending upon their action on different organs of the body. For example thyroxine, growth hormone and insulin can be included under *Mamsadhatvagni*, glucocorticoids, insulin and glucagone under *Medodhatvagni*, Vitamin D, calcitonin and *parathyroidhormone* under *Asthidhatvagni*, *testosterone*, estrogen and progesterone under *Shukradhatvagni* etc. [66]

7. Assessing certain psychological attributes like valor, courage, anger, enthusiasms etc. through certain questionnaires related to personality.

Characteristics of hypo functioning of Pitta Dosha [52,53,67]

<i>Stambha</i>	~ stiffness
<i>Shaitya</i>	~ coldness
<i>Aniyatatoda</i>	~ irregular pain
<i>Arochaka</i>	~ anorexia
<i>Avipaka</i>	~ indigestion
<i>Angaparushya</i>	~ roughness of the body
<i>Kampa</i>	~ tremor
<i>Gaurava</i>	~ feeling of heaviness
<i>Nakhanayanshaukla</i>	~ whitish coloration of nails and eyes
<i>Prabhahaani</i>	~ loss of luster
<i>Mandoanala</i>	~ weakness of digestive fire
<i>Mandoushmata</i>	~decreased body temperature

Pathological conditions associated with hypo functioning of Pitta Dosha [61,68]

1. *Arochaka* (Anorexia): Acute viral hepatitis, tuberculosis, chronic smoking or alcoholism, cirrhosis of liver, CRF.
2. *Dyspepsia* : peptic ulcer diseases, esophageal spasm, acute gastritis, gall stone, pancreatic diseases, hepatic diseases, NSAIDS, Corticosteroids, iron and potassium supplements
3. *Mandoushmata*(Hypothermia): hypothyroidism, hypopituitarism, exposure to cold temperature, immersion in cold water.
4. *Pallor*: Anemia

<i>Pittavrinanetratwaka/ Pittaavabhasta</i>	~yellow discoloration of urine, eye skin.
<i>Kshuta</i>	~hunger
<i>Trita</i>	~thirst
<i>Daha</i>	~burning sensation
<i>Alpanidra</i>	~lack of sleep
<i>Santapa</i>	~ increased body temperature
<i>Sheetakamitya</i>	~desire for cold
<i>Murchha</i>	~fainting
<i>Balahani</i>	~diminished strength
<i>Indriyadoubralya</i>	~weakness of sensory organs
<i>Glaani</i>	~lassitude, exhaustion
<i>Ojavisransa</i>	~decreased Oja
<i>Daaha</i>	~burning sensation
<i>Raaga</i>	~reddish discoloration
<i>Ushma</i>	~heat
<i>Paakita</i>	~ inflammation or suppuration
<i>Sweda</i>	~perspiration
<i>Kleda</i>	~moistness
<i>Struti</i>	~exudation
<i>Kooha</i>	~putrefaction
<i>Sadan</i>	~debility
<i>Mada</i>	~insanity
<i>Katuamala</i>	~bitter sour taste in mouth
<i>Panduarunavarjita</i>	~appearance of color other than yellowish white and crimson
<i>Tiktasyata</i>	~bitter taste in mouth
<i>Krodhaadi</i>	~ psychological symptoms like anger etc.

Features of hyper functioning of Pitta Dosha [56-59,69,70]

Characteristics of burning sensation produced due to aggravated Pitta depends upon sites (Dushya/Dhatu) and associated Dosha: [71] terminologies like

Dava, *Daha* etc. in different disorders associated with vitiation of *Pitta*. Following are the words used in Ayurveda to express the various types of burning sensation.

Daha: severe burning sensation all over the body

Osha: burning sensation accompanied with sweating and restlessness.

Plosha: localized burning sensation without sweating as through touched by flame.

Dava: burning sensation in mouth, lips, palate.

Davathu: burning sensation in eye and other sense organs.

Vidaha: various types of burning sensation in palm, sole and shoulders.

Antardaha: burning sensation inside the alimentary tract

Dhumaka: feeling of movement of hot fumes inside the head, neck, throat and palate.

Amlaka: burning sensation in alimentary tract accompanied with pain in heart and sour belching.

Shonitakleda: blackish discoloration, bad smell and thinness of blood.

Mamsakleda: blackish discoloration with foul smell

Pathological conditions associated with Pitta Dosha Vriddhi are [62, 68]

1. *Pittavabhasta* (Hyperbilirubinemia): Jaundice, Hemolytic Anemia, Hyperpyrexia.

2. *Bhrama*(Vertigo): vestibular neuritis, trauma, meningitis, brain stem ischemia or infarction, migraine, multiple sclerosis.

3. *Alpanidra* (Lack of sleep) : Hyperthyroidism, excessive caffeine intake

4. *Santapa* (Hyperthermia): pyogenic infection, brain lesion, hyperthyroidism, diabetes insipidus.

Kapha Dosha

Functions of Prakrita Kapha- *Kapha* being in normalcy is responsible for the functions like unctuousness, cohesion, steadiness, heaviness, virility, strength, forbearance, patience and greedlessness. [72,73]

Assessment parameters for different functions of Kapha Dosha.

1. *Bala* – Fatigue Index (Generalized, Localized)/ internal and external. Assessment of *Bala* both physical and psychological through *Sara* assessment questionnaire [74] or by observing *Vyayama Shakti* or stress response, Fatigue Index. Biochemical analysis of Immunoglobulin, CD4, CD8 and TLC, DLC.

2. *Bandha*: skin fold thickness, Anthropometry measurement.

3. *Sneha*-Lipid Profile, Skin Moisture, Skin Sebum

4. *Dhruiti*- Short term and long term Memory, cognition and conation, learning capacity.

5. *Gaurava*- BMI

Characteristics of hypo functioning of Kapha [52, 53, 67]

<i>Bhrama</i>	~giddiness
<i>Udveshtana</i>	~convulsion, contraction
<i>Anidra</i>	~loss of sleep
<i>Angamarda</i>	~pain in whole body
<i>Pariplosha</i>	~mild burning sensation
<i>Toda</i>	~pricking pain
<i>Dava</i>	~burning sensation in mouth, lips and palate.
<i>Daaha</i>	~severe burning sensation all over the body
<i>Sphotana</i>	~splitting, cracking, tearing
<i>Vepana</i>	~tremor/trembling
<i>Dhumayana</i>	~movement of hot fumes from inside
<i>Sandhisaitiliya</i>	~looseness of joints
<i>Hridayadrava</i>	~palpitation
<i>Shleshmashayshunyata</i>	~emptiness in seat of <i>Kapha</i>

Pathological conditions associated with hypo functioning of Kapha Dosha: [61]

Hypo salivation: dehydration, sialolithiasis

Palpitation (Hridayadrava): Hypoglycemia, Hypovolemia, Atrial fibrillation, bradyarrhythmias

Features of hyper functioning of Kapha Dosha: [56,57,59,69,75]

<i>Agnisadana</i>	~diminished digestive activity
<i>Praseka</i>	~excess salivation
<i>Gouravam</i>	~feeling of heaviness
<i>Shaitya</i>	~coldness
<i>Swetaya</i>	~white discoloration
<i>Slathangatva</i>	~looseness of body parts
<i>Swasha</i>	~dyspnea
<i>Kasa</i>	~cough
<i>Atimidrata</i>	~excess sleep
<i>Tandra</i>	~inability to perception as through engrossed in sleep
<i>Sthoulya</i>	~plumpness
<i>Angasada/</i>	~Fatigue,(Sada: exhaustion weariness)
<i>Srotopidhana</i>	~obstruction in channels
<i>Murchha</i>	~fainting
<i>Harllasa</i>	~nausea
<i>Sandhivishlesha/ Sandhasthivishlesha</i>	~looseness of joints
<i>Sthairya</i>	~immobility
<i>Sneha</i>	~unctuousness
<i>Kathinya</i>	~hardness
<i>Kandu</i>	~itching
<i>Sheeta</i>	~coldness
<i>Gauravam</i>	~heaviness
<i>Bandha</i>	~obstruction
<i>Upalepa</i>	~coating inside the channels
<i>Staimitya</i>	~rigidity, immobility, numbness
<i>Shopha</i>	~swelling
<i>Atimidrata</i>	~excess sleep
<i>Swetavarna</i>	~whitish discoloration
<i>Chirakarita</i>	~delay in all activities
<i>Svaadulavana</i>	~sweet and sour taste

Cough (Kasa): laryngitis, tumor, tracheitis, bronchitis, asthma, tuberculosis, pneumonia, pulmonary edema, bronchiectasis etc.

Dyspnea (swasa): Pneumonitis, hydrothorax, pulmonary embolism.

Vomiting (Chhardi): raised intracranial pressure, meningitis, gastro paresis, diabetic ketoacidosis and Addison's diseases.

Hypersomnolence (Atinidra): obesity, Narcolepsy, idiopathic

Hyper salivation (Praseka): disease of esophagus, intestine, stomach, nausea and vomiting.

Overlapping Features of Vitiated Dosha-

- Insomnia-Kapha Kshaya, Vata Vriddhi
- Dhumayana-Pitta Vriddhi, Kapha Kshaya

Principles of management of discordance Dosha:

1. *Dosha* and *Dhatu* has intimate relationship as *Ashraya* and *Ashraiya* i.e.

Vata resides in *Asthi*, *Pitta* in sweat and *Rakta*, *Kapha* in remaining sites i.e. *Rasa*, *Mamsa*, *Meda*, *Majja* and *Shukra*, and due to this increase or decrease in one will result in same for the other except *Asthi* and *Vayu*. [76]

2. The person who has decrease of *Dosha*, *Dhatu*, *Mala* or even *Bala* develops desire for food and drinks which makes them to increase, the person debilitated because of lack of food desires food and after getting it, he gets over that debility. [29] Avoiding the disliked food and indulgence of desired one helps in controlling the *Kshaya* and *Vriddhi* of *Dosha*. [77]

Increased *Dosha* produces desire of substances having dissimilar property to *Dosha* while the decrease *Dosha* produces desire of food substances having similar properties. It is inbuilt property of body elements to demand of what is deficient, for example pica

desire in iron deficiency anemia. Desire for cold and sour things in case of *Rakta Kshaya*,^[78] craving for fatty meat in case of *Meda Kshaya*,^[78] flesh attached with bone (*Asthibadhamamasta*) in case of *Asthi Kshaya*,^[79] desire for hot substances in case of *Vata Vriddhi*, desire for cold things in case of *Pitta Vriddhi*.^[59]

3. The decreased *Dosha* should be increased, the *Kupita Dosha* should be suppressed, the increased should be removed and *Sama Dosha* should be maintained.^[80]
4. Generic concomitance (*Samanya*) augments the factors but variant factors (*Vishesha*) are responsible for the diminution.^[28] In case of *Dosha Vriddhi*, *Vishesha* factors should be given in case of *Dosha Vriddhi* while *Samanya* factors should be given in case of *Dosha Kshaya*. These principle may act through the receptor mechanism, the *Samanya* factors augments the functions through agonist action while *Vishesha* factors antagonizing their action.
5. To follow diet and regimen described for each seasons. For each season diet and regimen has been described which should be followed to maintain the health. *Shodhana Karma* described in accordance to season should also be applied for the maintenance of health. The *Dosha* which are increased slightly in *Varsha*, *Hemanta*, and *Greeshma Ritu* should be eliminated when they are greatly increased i.e. in *Sharad*, *Vasanta* and *Hemanta Ritu* respectively.^[81] Circadian rhythm is result of interaction between endogenous and exogenous factors. Following these guidelines may help in regulation of this interaction, by balancing the endogenous factor in accordance with exogenous factor.
6. The regimens which are of opposite qualities of that of habitat and disease should be followed.^[82]

Importance of Knowledge of *Kshaya Vriddhi* of *Dosha*: Acharya Sushruta has advised that an intelligent

physician should have knowledge of features of normalcy or abnormalcy of *Dosha*. He should try to balance the *Dosha* by increasing the decreased one and decreasing the increased one.^[83]

CONCLUSION

When all the biological entities i.e. *Dosha*, *Dhatu*, *Mala* are within their physiological limits qualitatively and quantitatively then it leads to state of health and any deviation (*Kshaya* and *Vriddhi*) beyond physiological limits produces discomfort or diseased state of body. The *Dosha* according to their different functional state produces different type of diseases and symptoms. Diseases produced by them might be either *Samanayaja* or *Nanatamaja* depending upon the type of etiological factor and aggravated *Dosha*. As diseased produced are innumerable in numbers due to huge diversity in etiological factor, degree of aggravation, site for diseases production etc. it is a difficult task to provide assessment criteria for the different functional state of *Dosha* (normal, hypo and hyper functioning). However the suggested criteria can serve a path for enlightening the scholars of Ayurveda to have a broad prospective regarding the *Kshaya Vriddhi* of *Dosha* and thus better diagnosis and treatment. Again the objective parameters provided for the assessment of normal functioning of *Dosha*, need some sort of associative study to proof its consistency and if not then development of a better tool or parameters for the same.

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