

Chapter- 2
Ancient Literary Research
CONCEPT OF HOMEOSTASIS
ACCORDING TO ĀYURVEDA AND YOGA

2.0. Introduction

Āyurveda is an ancient science which emphasizes balance of all systems of the body for promotion of physical and mental health, and prevention and cure of the disorders. *Āyurveda* says that the main aim of a clinician should be protecting/ maintaining the health of the healthy (*Svāsthasya svāsthya rakṣaṇam*) (*Saṁhitā*, 2001). A major division of *Āyurveda* (*Swathavritta*) deals with detailed descriptions of lifestyle to be adopted in relation to diet (*Āhāra*), Physical activity (*Vihāra*), daily routine (*Dincaryā*) including duration of sleep, timings for sleeping and working, timings for spiritual practices and family life etc. Also, there is description of changes to be adopted according to seasonal variations (*Āritucaryā*), by different age groups, genders and also during pregnancy and lactation etc. (Raveenthiran, 2011). Health (“*Svāsthya*”-being established in oneself) is achieved by “*Samatva*”, a balanced state of functioning. In the science of *Āyurveda*, we find a comprehensive definition of health that refers to homeostatic functioning of all systems of the body. *Āyurveda* defines health as a state of homeostasis in terms of *Doṣa*, *Agni*, *Dhātu*, *Mala* and pleasantness of *Indriya*, *Manas* and *Ātmā*.

2.1. Definition of health according to *Āyurveda*

समदोषः समाग्निश्च समधातुमलक्रियः ।

प्रसन्नात्मेन्द्रियमनाः स्वस्थ इत्याभिधीयते ॥

Samadoṣaḥ samāgniśca samadhātumalakriyaḥ |

Prasannātmendriyamanāḥ svastha ityābhidhiyate | |

(Śuśruta Saṁhitā Sūtrasthānam 15/41)

Health is a state of equilibrium of all metabolic components of body (*Doṣā* - biological force, *Dhātus*- tissues and *malas* – metabolic toxins), tranquility of mind, soul and sense organs (*Suśruta Saṁhitā Sūtrasthānam 15/41*).

The ancient science helps an individual to be in a balanced state in all aspects of life namely the physical, physiological and psychological states. *Āyurveda* is a science that deals with

health and hence focuses on physiological balance (*Tridoṣa* balance) whereas *Yoga*, a science for human evolution to greater heights of cognitive evolution refers to *samatva* (homeostasis) at the mind level (balance of *trigunas* and beyond) (Schweig, G. M. 2007). *Āyurveda* essentially focuses on balance of *Tridoṣa*, the basic vital energy systems, specific to each individual personality (*Prakṛti*). The *doṣās* are in dynamic equilibrium adapting constantly to both the internal and environmental needs of the system (Lad, 2002).

2.2. Concept of *Tridoṣa*

दूषयन्ति मनः शरीरं च इति दोषाः ।

Dūṣayanti manaḥ śarīraṁ ca iti doṣāḥ ।

Doṣā is the vital energy which governs all functions of the mind –body complex. The etymology of *doṣā* is ‘*dūṣayanti iti doṣāḥ*’ which means *doṣā* is that vital energy which can get vitiated and produce dys-regulation of the metabolic processes in the body.

Based on the functions, *doṣā* is classified as *śārīrika doṣā* (physical or bodily *doṣās*-physical bio-energies) and *mānasika doṣā* (psychodynamic bio energy). The physical *doṣā* (*śārīrika doṣā*) are of 3 types - *vāta pitta* and *kapha*.

वायुः पित्तं कफश्चेति त्रयो दोषाः समासतः ।

Vāyuḥ pittam kaphaśceti trayo doṣāḥ samāsataḥ ।

Doṣās maintain good health when they are in balance and lead to ill health when they are in an excited state (*Suśruta Samhitā*).

2.3. Correlating homeostasis and *Samatva*

Homeostasis is a state of bio-rhythm which is maintained dynamically under any varying circumstance. It refers to maintaining a relatively stable equilibrium between interdependent elements, especially as maintained by physiological processes. This dynamic state of equilibrium is the condition of optimal functioning for the organism that results in proper functioning of all the systems to maintain health.

Āyurvedika definition of *samatva* correlates with this definition of Homeostasis is which may be referred to as a ‘dynamic state of equilibrium between physical (*Doṣās*, *Dhātus* and *Malās*), tranquility of mind, soul and sense organs, it is said that *sama-Prakṛtidośa* and *dhātus* (bioenergy systems and the tissues) are responsible for proper functioning of all the organs including the mind. In this way *Āyurveda* defines health as homeostasis-*samatva* in body and mind.

विकारो दोष वैषम्य । साम्यं प्रकृतिरुच्यते ।

Vikāro doṣa vaiṣamyāni | sāmyāni prakṛtirucyate |

Balanced functioning (*Samya*) of all bioenergy systems (*Doṣās*) is the natural state (*prakṛti*) state of being; vitiated functioning of the *doṣās* leads to imbalance. (Veith, I.1961).

समधातुमलक्रिय इति समा प्राकृतधातूनां मलानां च क्रिया प्राकृतकर्मरूपा यस्य स तथा अन्न क्रियाग्रहणं
समक्रियै धातुमलानां परोक्षणां प्रायः सम्यावगतिरिति सूचनार्थम् ।

*Samadhātumalakriya iti samā prakṛtadhātūnāni malānāni ca prakṛatkarmarūpā yasya sa
anna kriyāgrahaṇāni samakriyayai dhātumalānāni parokṣāṇāni prāyaḥ samyāvagatiriti
sūcanārtham |*

(*Ḍalhaṇa teekta sutrasthāna 15/41*)

Samadoṣās, *dhātus* and *malās* means the *Prakṛtiavasthā* of *doṣās*, *dhātus* and *malās*. In turn it represents the state of metabolic homeostasis (*Ḍalhaṇa teekta sutrasthāna 15/41*). There are two main states of *doṣās*, *dhātus* and *malās*.

2.3.1. *Prakṛti*- Balanced

Prakṛti(balanced) *doṣaḥ* (bioenergy) and *dhātus* (tissues) which are in the state of equilibrium perform their functions accurately. Each *doṣaḥ* and *dhātus* have their particular functions, e.g. *pācana kriya* (digestion) is the function of *prakṛita pitta*.

(*Gaṇeśa sārtha Vāgabhaṭṭa Sūtrasthāna*)

Prākṛta *mala* (excretory function) refers to normal excretion of all the three *malas*- *puriṣa* (feaces), *mūtra* (urine) and *sweda* (sweat).

(*Gaṇeśa sārtha Vāgabhaṭṭa Sūtrasthāna*)

Vikṛti is the state of dys-equilibrium. It is either increase or decrease of the *doṣa*, *dhātu*, *mala*. For example if there is *vikṛti* of *pitta* i.e. derangement in functioning of *pittadoṣa*, it gives rise to indigestion, gastritis.

(*Gaṇeśa sārtha Vāgabhaṭṭa Sūtrasthāna*)

There are four types of *Agni* which are responsible for metabolism.

1. *Mandāgni*- reduced digestive fire which is caused by the *vikṛti* of *kapha doṣa*, is the main cause for many of the diseases.
2. *Tīkṣṇāgni*-increased digestive fire which is caused by the *vikṛti* of the *pittadoṣa* is also a state of altered metabolism.
3. *Viśamāgni*- vitiated digestive fire, which is caused by the vitiation of *vāta doṣa* which is the cause for constipation etc.
4. *Samāgni*- which is in a state equilibrium gives health and correlates with metabolic homeostasis.

(*Gaṇeśa sārtha Vāgabhaṭṭa sūtrasthāna*)

2.3.2. *Vikṛti* (Dysbalanced)

Dysruption of Homeostasis

Āyurveda proposes the fact that if there is *vikṛti* i.e if *samatva*, equilibrium is disturbed then it results in manifestation of a disease.

रोगस्तु दोष वैषम्यं दोषसाम्यमरोगता ।

तेषां कायमनोभेदादधिष्ठानमपि द्विधा ।

रजस्तमश्च मनसो द्वौ च दोषबुहतौ ॥

*Rogastu doṣa vaiṣamyāni doṣasāmyarogatā |
Teṣāni kāyamanobhedādĀdhi ṣṭhānamāpi dvidhā |
Rajastamaśca manaso dvau ca doṣavuhratau | |*

(Aṣṭāṅga saṅgraha sūtrasthāna 1/43,44)

Dysregulation of *doṣas* causes disease. Equilibrium of *doṣas* is health. Two seats of diseases are body and the mind. *Rajasa*, and *tamasa* are two *doṣa* of the mind (*manas*).

(Aṣṭāṅga saṅgraha sūtrasthāna)

प्रसन्नात्मेन्द्रिय मन इति आत्मादि प्रसन्नता दुःखरूपाग्न्यादिवैषम्यात्मकविकारविरहितत्वेन भवति न हि दुःखयोगे
सत्यात्मादि प्रसन्नता संभवति ।

Prasannātmendriya manā iti ātmādi prasannatā

*Duḥkharūpāgnyādivaiṣamyātmakavikāravirahitatvena bhavati na hi duḥkhayoge Satyātmādi
prasannatā sambhavati |*

(Dalhana teekta sūtrasthāna 15/41)

Prasannātmendriya manāh means absence of the state of *duḥkh* (sorrow). Sorrow comes as the result of vitiation of *mānasika doṣa*, *rājasika* and *tamasa*. When these are in *prakratika avasthā*, and *satva guṇā* is more mind will attain a state of *samatva* and health. According to this and earlier quoted verse homeostasis at the level of mind is the state of *sattva guṇā* which occurs when *rajasa* and *tamasa* are balanced.

(Sushruta Samsthana)

2.4. Diabetes mellitus, according to Āyurveda

Terms used in *Āyurveda* for diabetes mellitus - *Nirukti* (derivation)-*Madhumēha* which seems to correspond to diabetes mellitus is described as one of the types of *Pramēha* (*Caraka nihitā cikitsāsthānam 6/55*) in *Āyurveda* texts by all authors:

मधुमेही मधुसमम् ।

Madhumēhī madhusamam |

Taste of the urine in *Madhumēha* disease is sweet. (*SārthaVāgbhaṭṭa*Nidānasthānam 16 /19), *madhumēha* is a compound word made up of *madhu* and *Mēha*. So, *madhumēha* is the disease in which urine has the quality of honey (*madhu*) in its color, smell, taste and consistency.

KshaudraMēha- *Kshaudra* refers to one variety of honey (*Madhu*) and is synonymous with *madhu* in *sanskrita* Literature.

(*Suśruta Saṁhitā*)

OjoMēha: This term *OjoMēha* is also used by *ācārya caraka* to denote *madhumēha*. *OjoMēha* is one of the four types of 6 *vātajā* varieties of *Pramēha*. In this type, depletion of *ojas* through urine takes place by vitiated *vātadoṣa* along with changes in taste and appearance.

PuṣpaMēha: *Puṣparasa* denotes *Madhu*.

(*Nidānasthāna Sūśruta Saṁhitā*)

2.4.1. Definition of Diabetes (*Madhumēha*)

The clinical entity in which the patient passes urine similar to *Madhu* i.e. urine which has astringent (*Kashaya*) and sweet (*Madhura*) taste, and honey (*Madhu*) like in its colour and the body acquires sweetness and dryness (*Rūkṣṇa*) in texture is called *Madhumēha*.

(*Caraka Saṁhitā* 6/55)

2.4.2. *Pramēha-Nirukti* (Derivation): Definition of the word *Pramēha*

Pramēha refers to diabetes in general. *Madhumēha* to diabetes mellitus.

The word *Pramēha* consists of two words-

प्रकृष्टो मेहः यस्मिन् रोगात् स प्रमेहः ।

Prakruṣṭo Mēhaḥ yasmin rogāta sa Pramēhani |

Mēha is derived from the root '*mihsechane*' meaning to perfuse (watering). Excessive quantity and frequency are indicated by the prefix. This refers to the main characteristic

feature of *Pramēha* which is excess (*prabhūta mūtratā*) and frequent (*āvila mūtratā*) urination.

2.4.3. Altered homeostasis (*Samatva*) in *Pramēha*

मेदश्च मांसं च शरीरजं च
क्लेदं कफो बसिगतं प्रदूष्य करोति मेहान् ।

*Mēdaśca māṁsani ca śarīrajani ca
Kledani kapho basigatani pradūṣya karoti mehān |*

(*Caraka Cikitsā-6/5*)

Disturbed equilibrium state of *mēda dhātu* (lipid tissue), *māṁsadhātu* (muscle) and *kapha doṣa* causes the disease *Pramēha*.

(*Caraka Samhitā Cikitsā Sthānam 6/5*)

2.4.4. Classification of Diabetes (*Pramēha*): Basis of dominant *doṣa* disturbance

Caraka Samhitā has suggested a stepwise approach towards the management of a disease. Before treating the disease, it is important to examine the patient thoroughly and make the correct diagnosis. This can be done based on the classification provided. (*Caraka Samhitā Nidānasthānam*)

In *Samhitā Granthās*, *Ācāryās* have classified *Pramēha* on the basis of dominance of specific *doṣās*. *Caraka* and *Suśruta* have described the involvement of all three *doṣās* in the pathogenesis of *Pramēha*. Further, more recent *ācāryās* have classified *Pramēha* into 20 types. According to *Caraka*, cornerstone of classification of *Pramēha* into 20 types is based on the specific character acquired by the urine (*mūtra*) resulting from the combination of aggravated qualities of *doṣās*. Specific type of *Pramēha* is named after one of these qualities are based on the overall latent properties involved. *Ācāryā Vāgabhaṭṭa* and *Suśruta* also have opined the same.

Suśruta has described the specific *doṣa-dūṣya* involvement in specific *dūṣajā* type as below: -

Sl. No.	Type	Main vitiated <i>Doṣa</i>	<i>Dhātu</i>	Secondary vitiated <i>Doṣa</i>
1	<i>Kaphaja Pramēha</i>	<i>Kapha</i>	<i>Mēda</i>	<i>Vāta-pitta</i>
2	<i>Pittaja Pramēha</i>	<i>Pitta</i>	<i>Mēda, Rakta</i>	<i>Vāta -kapha</i>
3	<i>Vātaja Pramēha</i>	<i>Vāta</i>	<i>Mēda, Majjā, Vasā</i>	<i>Kapha-pitta</i>

Among the 20 types of *Pramēha* described by *Acharyas*, there are different opinions regarding their names and their nature in some of the types. Out of 20 types, 10 belong to *kaphaja* variety, 6 are of *pittaja* type and remaining 4 come under *vātaja* category (*Caraka Samhitā; Suśruta Samhitā; VāgabhaṭṭaSamhitā*). Classification in to *vātaja, pittaja* and *kaphaja Pramēha* (*Caraka Samhitā* 6/8).

Table- 4: Types of *Pramēha*

<i>Pramēha</i>		
<i>Kaphaja (Dominant)</i> + <i>pitta and vāta</i> 10 types	<i>Pittaja (Dominant)</i> + <i>kapha and pitta</i> 6 types	<i>Vātaja (Dominant) +</i> <i>vāta and kapha</i> 4 types <i>Vasā mehā, majjā mehā, hasti mehā Madhumēha</i> <i>Rakta mūtra śarkarā</i>

(*Ch. Chi* 6/55; *Su.Ni.*6/14. and *Sa. Sa.* 7/62)

Although all types of *Pramēha* have all *doṣā* disturbed, there is dominance of one *doṣā* in each type of *Pramēha*.

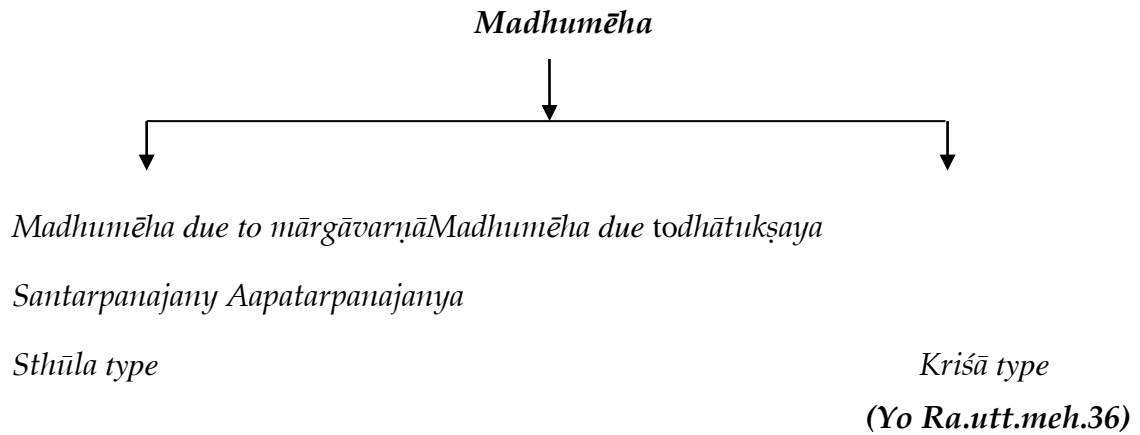
There are 4 types of *vātajaPramēha*:- *Vasāmehā, Majjāmehā, Madhumēha* [*OjoMēha/ KuśudraMēha*]. *Madhumēha* can be further classified as *dhātuk-ṣayaja* and *avarāṇa-janya*. *Vāgabhaṭṭa* has highlighted this way of classification of *madhumēha*. *Caraka* has described

madhumēha in (Ch.Chi.-4, Ch.Chi.-6 and in Ch.Su. -17), out of which description in (Ch.Su. -17) is that of *avarāṇa-jānyamadhumēha* (Ch.Su. -17/78-80). *Cakrapāṇi* also (Ch.Chi.-4 and Ch.Chi.-6) describes (*Dhātukṣaya - āvarāṇajanya*) *madhumēha*.

2.4.5. Classification of *Pramēha* on the basis of pathophysiological process

Caraka has described two types of *pramelī* (person suffering from *Pramēha* is *apramelī*) according to their body constitution as: obese (*Sthūla*) and lean (*Kriśa*). Body constitution can give a clue to decide if it is born out of *antarpāna - jānya* (over nourishment) or *apatarpana-janya* (under nourishment) which is due to blockage/covering of the pathways through which the metabolic products have to flow or of *Pramēha*. This classification is important as the line of treatment is different for these 2 types (*Caraka saṁhitā*).

Fig 4: Classification based on pathophysiology



2.4.6. Etiology (*Nidana*) of Diabetes (*Pramēha*) and Diabetes Mellitus (*Madhumēha*)

Acāryas have designed *saṁhitā granthās* with the inclusion of separate contrives of factors and their role in the causation and progression of disease.

Causes for *Pramēha*: *Caraka* has described a wide range of *nidāna* of *Pramēha*. He has described specific food types, their specific combinations and specific habits responsible for

genesis of *Pramēha*. He has also mentioned specific *nidānas* responsible for aggravation of specific *doṣās* and thereby specific ‘*doṣajā*’ type of *Pramēha*. (*Caraka Saṁhitā nidāna-sthāna*). *Sūśrutā* has described two types of *Pramēha* as ‘*sahaja*’ and ‘*apathya -mittajā*’, which gives quite clear idea about the causes of *Pramēha*. *Aṣṭāṅgahrada-ya-Aaṣṭāṅgasaṅgraha* and *madhuvāṅkara* have the same opinion.

Causes for *Madhumēha*: In *Sūtrasthāna*, he has described specific causes responsible for ‘*Madhumēha*’. In *Cikitsāsthāna*, *Caraka* has stated *sahaja* (life style) and *kulaja* (genetic) origin of disease. In all, *nidāna* is responsible for *Pramēha* can be classified into three categories according to origin of disease as (*Suśruta Saṁhitā Nidānasthāna*).

2.4.7. *Apathyamittajā Nidāna* or *Sāmānya (common) Nidāna*

This variety of *Pramēha* is due to dominance of *kapha doṣa* (*Kaphaja*) which later results into disturbance of the other two *doṣa* (*Caraka*). All factors that produce aggravation of *kapha* can cause *Pramēha*. *Sāmānya Nidāna* described by *Suśruta* are the same as that described by *Caraka*. He has described two additional *nidāna*. *Vāgabhaṭṭācaryā* has described the same fact in (*A.Hr.Ni.10/1-3*). He has clearly implicated diet and behavior pattern responsible for genesis of *mēda*, *mūtra* and *kapha* in evolution of *Pramēha*. *Madhvakārācaryā* also has explained the same causes as that of *Caraka*.

Table 5: <i>Sāmānya Nidāna</i> of <i>Pramēha</i>: the etiological factors which are responsible for <i>Pramēha</i> (life style).	
1	<i>Āsyasukham</i> - interest in sedentary habits.
2	<i>Swapnasukham</i> - pleasure of sleep.
3	<i>Dadhini</i> - over indulgence of various preparations of curds.
4	<i>Grāmya, audaka, anupa rasa</i> - soups of meat of domesticated and aquatic animals belonging to marshy land.
5	<i>Payansi</i> - milk preparations.

6	<i>Navānnapānam</i> - freshly harvested food articles, freshly prepared drinks.
7	<i>Gudavaikṛtam</i> - various preparations of jaggary.
8	<i>Medyasevanam</i> - overindulgence of fatty substances which are responsible for fat genesis in the body. (<i>Suśruta</i>)
9	<i>Dravanasevanam</i> - excessive use of food in the form of liquid preparations (<i>Suśruta</i>).
10	Others- any <i>kapha</i> aggravating factor

2.4.8. *Ahāra nidāna* -Types of foods that aggravate *kapha* that results in *Pramēha*

Guru, snigdha, picchilasheetalabhojana, āmla, lavaṇa, madhurarasapradhāna-āharaatisevana, navānna, navamadhyasevana, atimatrabhojana, ikṣuvikara, kṣetrīkaraṇa, drāvaṇa, dadhisevana, grāmya, udaka.

ānūpamānsasevana, gudavikṛti, yavaka, chīnaka, uddālaka, itkata, mahavrīhi, sugandhaka, sarpiṣmathi, māṣa, supyakṣaka, tila, palala, piṣṭanna, pāyasa, kṛtāhāra, vilepi, ikṣuvikāra.

The above-mentioned *āhāra* are predominant in water (*āpāḥ*) and earth solid (*pṛthvi*) elemental (*Mahābhūta*) and have unctuous/adhering/sticky (*Snigdhdhī*) quality, which is the feature of *kaphadoṣa* and *medāsdhātu* (adipose tissue).

2.4.9. *Vihāraja-Nidāna*

- *Divā -Swapna*: This has been considered as a potential cause for aggravation of *kapha*, because a man is supposed to be active and wakefulness during the day; resorting to sleep causes inertia in the body and the accumulation of *pṛthvi* and *āpāḥ Mahābhūta* and is turbid *kapha doṣa*.
- *Avyāyāmā*: Sedentary life style is *avyāyāmā*: when the amount of intake exceeds that of spending, it results in accumulation of *mēdas* (fat) and *kapha*. Hence adequate amount of exercise is necessary to avoid *Pramēha*.
- *Aśyatīśukha*: Means sedentary lifestyle - pleasure in sitting or lying in the bed.
- *Svapnātisukha*: Excessive sleeping. Also related to dreams.

- **Ālasya:** *Ālasya* (laziness) is a state of lethargy of mind where a man becomes unable to carry out or undertake any task enthusiastically not because he is incapacitated due to ill health but only because he is unwilling or laziness.

2.4.10. *Bījadoṣa*: (Genetic factor) (Ch. Chi6/57, Ch.Ni.4, Su. Ni. 6)

The word *bījadoṣaja* has been mentioned in context of *sādhyā- asādhyatva* (curable or incurable conditions).

- *Ācārya Charakaa* has emphasized that if a part of the *bīja* is defective, the body part developing from that portion of *bīja* will be abnormal. Children born to a diabetic (*Madhumehī*) may or may not suffer from *madhumēha* as it depends on the *bīja bhāgāvāyavya* (the component of the gene), which is defected.
- Description of *kulaja* disease is found in *Caraka* and *Suśruta Saṁhitā* which denotes the role of inheritance that was known even in ancient times. *Pramēha* is mentioned under *ādibālāprāvṛittavyādhi* (disease born out of original disturbance).

2.4.11. Evolution from *Pramēha* to *Madhumēha*

If any type of *Pramēha* continues untreated or treated without careful diagnosis, for a longer time, it ultimately turns into *madhumēha*. That means any variety of *Pramēha* can be the etiological factor (*nidāna*) of *madhumēha*.

2.4.12. Clinical manifestation of *Madhumēha* –symptoms appear in two stages i.e.

***pūrvārūpā* (prodromal) and *rūpā* (manifest):**

2.4.12.1. *Pūrvā Rūpa* (Prodromal stage)

Pūrvā Rūpa (prodromal stage) appears prior to the manifestation of the disease and points to the forthcoming disease. It is the stage where *doṣa-dūṣya-saiiracanā* (the starting of interaction of causative factor and the *doṣa*) will begin. In this period the *rūpa* (clear picture) will be in *avyakta* (un-manifest disease) form or in *nirudu* (mild) stage. Specific *pūrvā rūpa* for *madhumēha* have not been mentioned anywhere in classics. They are discussed in the context of *pūrvā rūpa* of *Pramēha*.

2.4.12.2. Rūpa stage - signs and symptoms manifest stage of diabetes

The *rūpa* is the symptom which is produced after the disease manifests. In case of *Pramēha* premonitory signs for all types of *Pramēha* have been described in general, but for a particular *Pramēha* a particular urine character has been described. Various description of *rūpa* for *Pramēha* can be divided as follows:

1. *Pratyātmālākṣṇā* (Invariable features) of *Pramēha*.
2. *Rūpa* on the basis of premonitory signs.
3. *Rūpa* on the basis of etiology.
4. *Rūpa* of different *prame* has relation to *madhumēha*.
5. Specific symptomatology of *madhumēha*.

2.4.12.3. Pratyātmālākṣṇā (Invariable features) of Pramēha

The *āgama* (arrival) of *vikāra* (disturbance) is marked by the onset of *lakṣaṇas* (symptoms) and they are usually more severe symptoms of *pūrvārūpās* (prodromal symptoms). These are characteristic of *vyakta* (manifest) *avasthā* (state) of a *vyādhi* (disease) (*Ch.Ni.4, Su.Ni.6*).

The *rūpa* may be studied as follows:

A. Sāmānya Lakṣaṇa:

1. *Prabhutā Mūtratā*: Described as *Bhurimūtratā atimātratā mūtratā* and *mūtratā prabhutatva* as a result of accumulation of *dravyamaśā* which means increased frequency and quantity of urine.
2. *Āvila Mūtratā*: *Āvila Mūtratā* is also called *samala mūtratā* or *atyarathakaluśitamūtratā*, may be interpreted as abnormality in the density and turbidity of urine.

B. Viśiṣṭha Lakṣaṇās (Specific symptoms)

Mūtratā: *Madhuratā*, *Rūksata*, *Panḍutā*, and *Kṣayatā*.

1. **Madhuratā:** Refers to *rasa* of *mūtra*. The *rasa* of *ojasa* is *madhura* and hence also of the *mūtra* as evidenced by the attraction of *ṣaṭhpādapiṅṅikā* (ants) towards the urine.
2. **Rūksata:** Refers to the *guṇa* (quality or character) and *rūksa guṇa* (dryness quality) is due to *vridhdha-vāta* (abnormal increase in *vāta*).
3. **Pāṇḍutā:** The urine pallor - loss of its normal straw color due to increased dilution caused by abnormally increased *śarīrakleda* (increased fluidity of *dhātus* in the body).
4. **Kṣayatā:** *Bhavyamiśrācaryā* interprets this as *kṣaya varṇa* (brown color), it is difficult to elicit this condition clinically.

C. Sarva Daihika Lakṣaṇa (generalized bodily symptoms): (Ch.Ni.4, Su.Ni.)

a) The symptoms vary depending on whether it is - Apathya MittajāorSahaja:

(Apathya Mittajā Madhumēha Lakṣaṇās)

1. *Sthaulya* (Obesity)
2. *Bahuvāsī* (Excess food intake)
3. *Snigdḥā* (Unctuous/ sticky)
4. *Śayyāsanā, Svapna* (excessive sleep)
 - The *lakṣaṇas* mentioned above are in fact closely interlinked as *bhanuśī* leads to *snigdhatā* due to *kaphamedo - sañcaya* and *sthaulya*. Excess *medās* in *sthaulya* leads to reduced capacity to work as well as *ālasya* hence the patient always tends to be *śayyāsanā* (sticks to bed) and *svapnaśīla* (sleepy).
 - *Bahvashitva* (excess calorie intake) may be due to *laulyatā* (craving) in the beginning, but later when due to excess of *medośasañcaya* the *kaphamedāvritsāmanavāyu* which becomes limited to *koṣṭhās* causes *tikṣṇāgni* leading to *kṣudhati mātram*, the patient develops *atīa ākāṅkṣā* (craving) for food again leading to *bāhya vaśitva* (excess consumption).

b) Sahaja Madhumēha Lakṣaṇas:

1. Kṛṣa (Emaciated)
2. Alpaśee (Less food intake)
3. Rūkṣṇa (Dryness)
4. Paribrahmanaśīla (Excess walking, overactive)
 - The *alpa śītatva* (decreased food intake) leads to *kruṣṭha* (emaciation) and *rūkṣatā* (dryness) because of predominance of *Vāyu* as a result of *vāpavāhanaduṣṭhi* (urinary system).
 - These may be a cause for *madhumēha* and will persist to deteriorate later as soon as the disease progresses.
 - *Tanumadhuryatā*: According to *Vāgbhaṭṭa*, *tanumadhuryatā* (hyperglycemia) as a *pratyātmalakṣaṇa* (distinct features) of *madhumēha* (*vāgbhaṭṭa adhyāya daśa*).

c) Special features of madhumehī:

Suśruta explains the psycho-somatic state of *madhumehī* patient. According to him, *madhumehī* prefers to stand still than walking, sit than stand, lying down than sitting and sleeping than lying down. This feature has been explained as '*pañca-vidhā-kriyā-śrayaliṅgā*' by *Dalhanā* in this context.

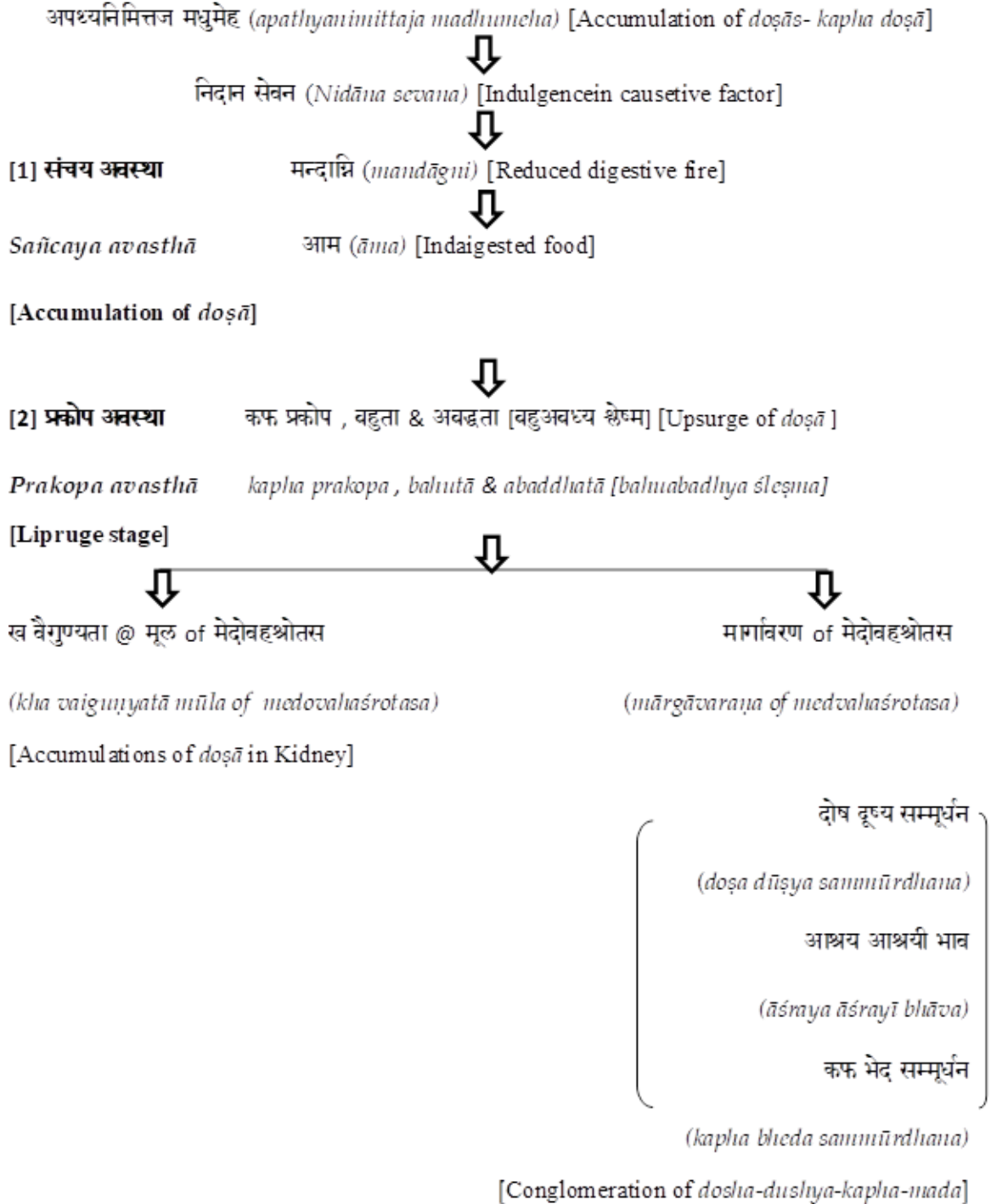
2.5. Samprāpti of madhumēha (Pathogenesis)

2.5.1. Ṣaṭ Kriyākāla - Pathogenesis of Pramēha

According to *Āyurveda* *Pramēha* is due to excess indulgence in unhealthy lifestyle. A lifestyle which includes unhealthy habits, high calorie intake, excess sweet diet, lack of physical activity/sedentary work, chronic mental stress, excess grief, depression, anger, etc. These leads to the accumulation of *doṣas* (*Sañcayāvasthā*), if the person continues with the same wrong lifestyle, it leads to aggravation of *doṣas* (*prakopa*). When *doṣas* get into *prakopa* stage, eventually they start moving to different parts of the body and get localized in the weak organ (genetically susceptible) called *sthāna samaśrayā*; when the *doṣas* get localized in particular place in the body they affect the functioning of *agni* (metabolic fire) which eventually leads to formation of metabolic toxins called "*āma*"; this leads to abnormal

functioning of the particular system/organ causing prodromal symptoms (*vyakta*) of the disease (nonspecific symptoms) and eventually manifests with specific symptoms of the disease (*bheda*).

Fig. 5: *Ṣaṭha Kriyākāla* : Pathogenesis of *Madhumēha* according to *Āyurveda*



↓
[3] प्रसर अवस्था प्रसर of दूषित कफ & मेद (*prasara of dūṣita kapha & Mēda*)

Prasara avasthā [Transmission of vitiated lipid profile]
[Transmission stage]

↓
[4] स्थानसंश्रय अवस्था Due to ख वैगुण्यता @ मेदोवहश्रोतस
Sthānasamśraya avasthā (*Due to kha vaig uṇyatā medovahaśrotasā*)
[Assimilation stage] [Assortment of vitiated *kapha, meda* in Kidney]

↓
वातानुबंधन- कफ आवरण वात दूष्टि
(*vātānubandhana kapha āvaraṇa vāta dūṣṭi*)

[Obscuring of *kapha* by *vāta*]

↓
श्लेष्म क्षय / धातु क्षय / अपर ओज क्षय

(*śleṣma kṣaya / dhātu kṣaya / अपर oja kṣaya*)

[Decreasing in *kapha dhātu, ojas*]

↓
[5] व्यक्त बस्ति प्रदेश (*basti pradeśa*) [Accumulation in Bladder]

Vyakta

↓
[Manifestation] अतिमूत्रता (*Atimūtratā*) [Increasing Urination]

↓
[6] भेद मधुमेह *Madhumeha* [Diabetes]

Bheda [Complication]

2.5.2. *Madhumēha* due to *Mārgāvaraṇa*: (Ch.Ni.4, Su.Ni. 6, Ch.Chi.6/55)

Vāta doṣa acquires *duṣṭi* by the process of *mārgāvaraṇa* and triggers off the process of *madhumēha*. This process of *mārgāvaraṇa* of *vāyu* due to *kapha* and *pitta* occurs in two kinds of people- in those who are obese (*sthūla*) and in those who are not *sthūla* but have indulged in *kaphamedokarāharā* and *vihāra*. If the *nidāna* for *pitta* are significant then it also gets *dūṣṭha*. Anyway, it should be remembered that the role of *pitta* is only secondary in nature.

The *sthūla* variety of *madhumēha* has been conspicuously identified by *suśruta* as *apathyamittajā*

2.5.3 *Madhumēha* due to *Dhātukṣaya*

The *Dhātukṣaya* causes *vātavṛddhi* which later triggers *madhumēha*.

- The patients with *sahajāmadhumēha* are *kraśā*, *alpaśi*, *pipāsabritam*, unlike *sthūlamadhumēha* is who are *sthūla*, *bhavyaśee* and with *bhavyaśeeśayyāśanasvapnasukriti*. Hence *madhumēha* occurs in *sahajāmadhumēha* is a direct consequence of *vāta* because of the inherent nature of such *rogīs*.
- But *madhumēha* as a result of *dhātukṣaya* in patients who were *sthūla* in the beginning but became *kraśā* due to long standing disease aggravates further due to *dhātukṣayājanya vātavṛddhi*. This stage can also be seen as terminal consequence *madhumēhas* due to other causes.

2.5.4. *Samprāpti ghaṭaka*: Pathology in different structures of the body

This is the only disease in which pathology is seen in most organs due to intense interaction between various functional pathways i.e. in *doṣa*, *dūṣya*, *mala*, *śrotasa*, and *avayavas* abnormality is observed.

Doṣa-kapha, followed by *vāyu* and *pitta*-all the 3 *doṣās* are disturbed.

Dūṣya- According to *suśrutamālā* is the common *dūṣya* in all *Pramēha*. *Caraka* enumerates 10 *dūṣyās* and named it as *dūṣyaviśeṣavyādhi*. *Vāgabhaṭṭa* first time included *śveda* as *dūṣya* of *Pramēha*. In *kaphajaPramēha* it is *mēda*, in *pittajaPramēha* it is *rakta* and *medo* while in *vātaja Pramēha* these are *vasā*, *majjā* and *mēda*.

Śrotasa (channels)- *Mūtravaha*, *medovaha*, *udakavaha*, *svedavaha*, *mānsavaha*, *rasavaha* are all affected.

Śrotoduṣṭi (dysfunction in channels/system)- *Sanga* (obstruction), *atipravṛatti* (hyperactive)

Agni- *Vaiṣamya* (abnormal functioning of agni) of all *Agnis* (or *dhātvaḥnimandva* (dysfunction in tissue metabolic factor))

Ādhi sthana(location)- *Basti* – (urinary system)

Udbhavasthana(origin)- *Āmāśaya* (stomach)

Āma (metabolic toxin)- *Medogata* (metabolic factors involved in adipose tissue) (*Āma* produced due to *jaḥharāḥnimāndya* (digestive factors) and *Dhatvāḥnimandya*).

Bhedāvastha- Occurrence of *Upadravas* (complications) such as *putimānsa* (muscle wasting) and *Pramēhapiḍika* (diabetic ulcers) etc.

Nature– *Cirakāri*(chronic), *Aanushanga* (metabolic dysfunction).

2.5.5. Diabetes according to Yoga philosophy- Pathogenesis of T2DM

According to *Yoga* philosophy diseases (*Vyādhis*) which manifest in the body are of two types:

a) **Ādhijā Vyādhi**– Originates from *manomaya koṣa*.

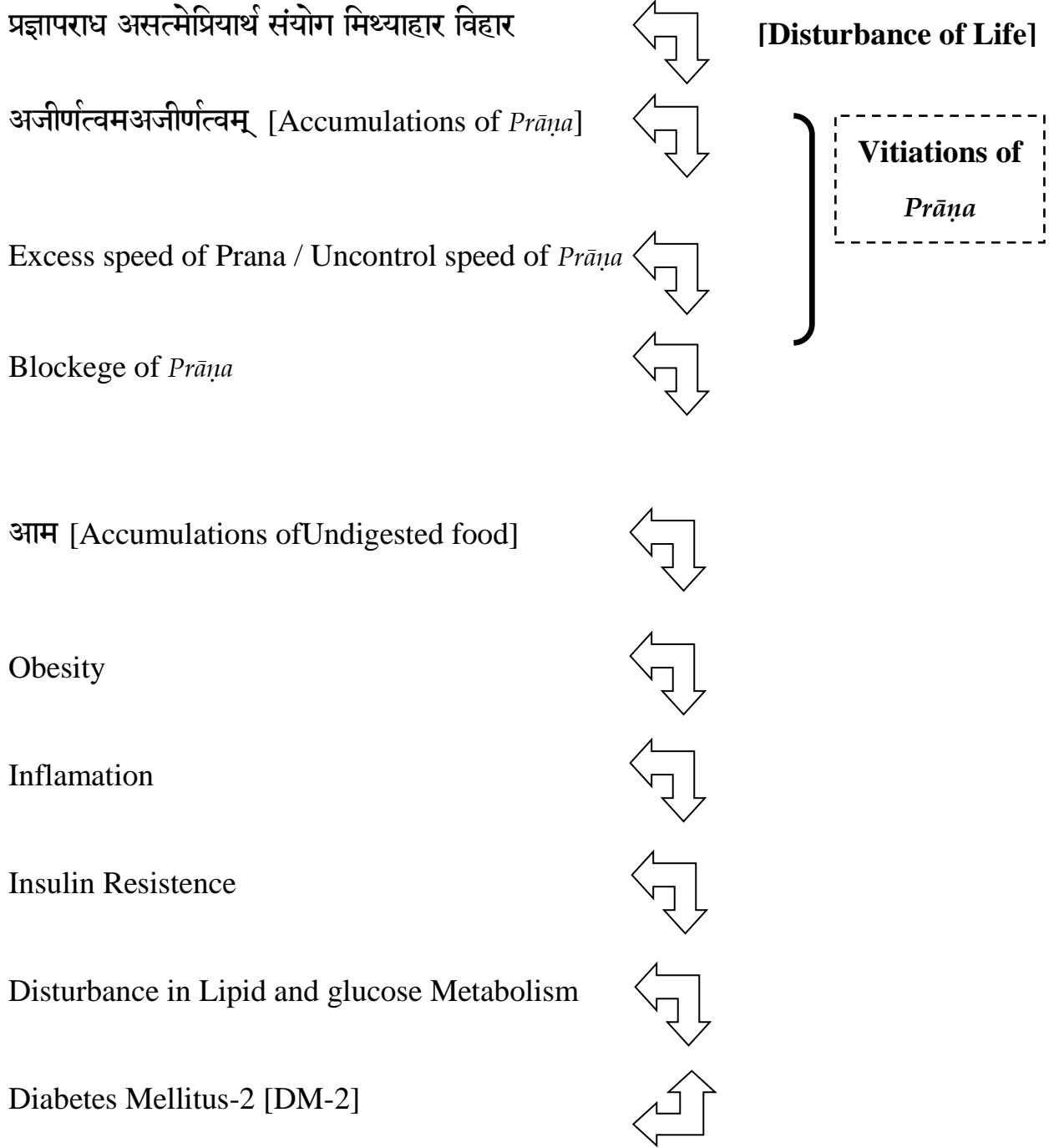
Ādhi is that which covers *viññānamaya koṣa*, this is in the form of deep root psychological conflicts, emotional upsurges, in the *manomaya koṣa*. This *ādhi* affects the *prāṇamaya koṣa* a

using disharmony in the *Prāṇamaya koṣa*. Imbalance in the *Prāṇamaya koṣa* down-percolates in the *Annamaya koṣa*.

b) *Anādhijā Vyādhi*– *Anādhijā Vyādhis* are diseases by external factors such as infections, insect bites, poisoning, accidents, pollution etc.

According to *Yoga* T2DM may be considered an *Anādhijā vyādhis*. *Ādhi* results from increased *rajas* and/or *tamas* and decreased *satvaguṇā* of the mind. In this mental state, the person often tends to follow unhealthy lifestyle. Increased *rajas* and *tamas* in the *manomaya koṣa* creates a *vegā* (uncontrolled spinning speed of thoughts in the mind); this *vegā* from the *manomaya koṣa* percolates into *prāṇamaya koṣa* as uncontrolled spinning speed in *prāṇamaya koṣa*. This percolate and settles down in *annamaya koṣa* (vulnerable organ) as uncontrolled tissue damage.

Fig. 6 : Pathogenesis of type 2 diabetes mellitus according to *Yoga* philosophy



Management of diabetes

Principles of treatment for *Madhumēha* by *āyurvedācāryā*

It has been stated that *madhumēha* is *avātajā Pramēha* and most of the classical texts talk about the treatment of *Pramēha*, but basically *madhumēha* is very different from *Pramēha*. So, the treatment of *madhumēha* will be very different from that of common treatment recommended for *Pramēha*.

Ancient texts also talk about *madhumēha* as a chronic form of *Pramēha*. It is said that when *Pramēha* is not treated properly and the condition becomes chronic, then that condition leads to *madhumēha*. Further, *madhumēha* can lead to various complications such as- excess *medās* (obesity), *piḍikās* (ulcers). Therefore, *Suśruta*, *bhavyaprakāśā* and *Harita saihitā* say that the chronic stage of *vātajā Pramēha* or *madhumēha* (Stage of complications such as leg ulcers *piḍikās*), or can be considered as an incurable condition.

Suśrutā has said that patients suffering from *madhumēha* should be treated by *tikṣṇa virecanā* (intensive detoxification through therapeutic purgation). *mrdu virecanā* cannot help because of their body is pervaded by excessive fat (*medās*).

Harita Sainhitā says that *madhumēha* is very difficult to cure or sometimes incurable as it is *vātajā Pramēha* and it differs from *śucitras* recommendation; it recommends that treatment should be done after giving a small *virecanā*. *Hārīta Sainhitā* recommends *samāna auśadhis* such as *Haritakī*, *Jayaphalā cūrṇa* and lehya of *triphalā* for chronic *Pramēha*.

All the three herbs purge out the *vāta* (*Vātānulomakā*) and can lead to *virecanā*. Opinion of *Aṣṭāṅga Saṅgrahais* same as *Śuśrutā* for the treatment of chronic *pramēhī*.e. they should be treated by giving *tīvra virecanā* because they have excess of *medās*.

Thus, it appears that the treatment of *madhume* has should be done by *tīvra virecanā* followed by *rasāyana* (rejuvenating herbs), *samānaauśadhi* (cooling medications) and *nidāna parivarjana* (Perfect diet and physical activity *āhāra vihāra*).

Summary of management of *Madhumēha* according to *Āyurveda*

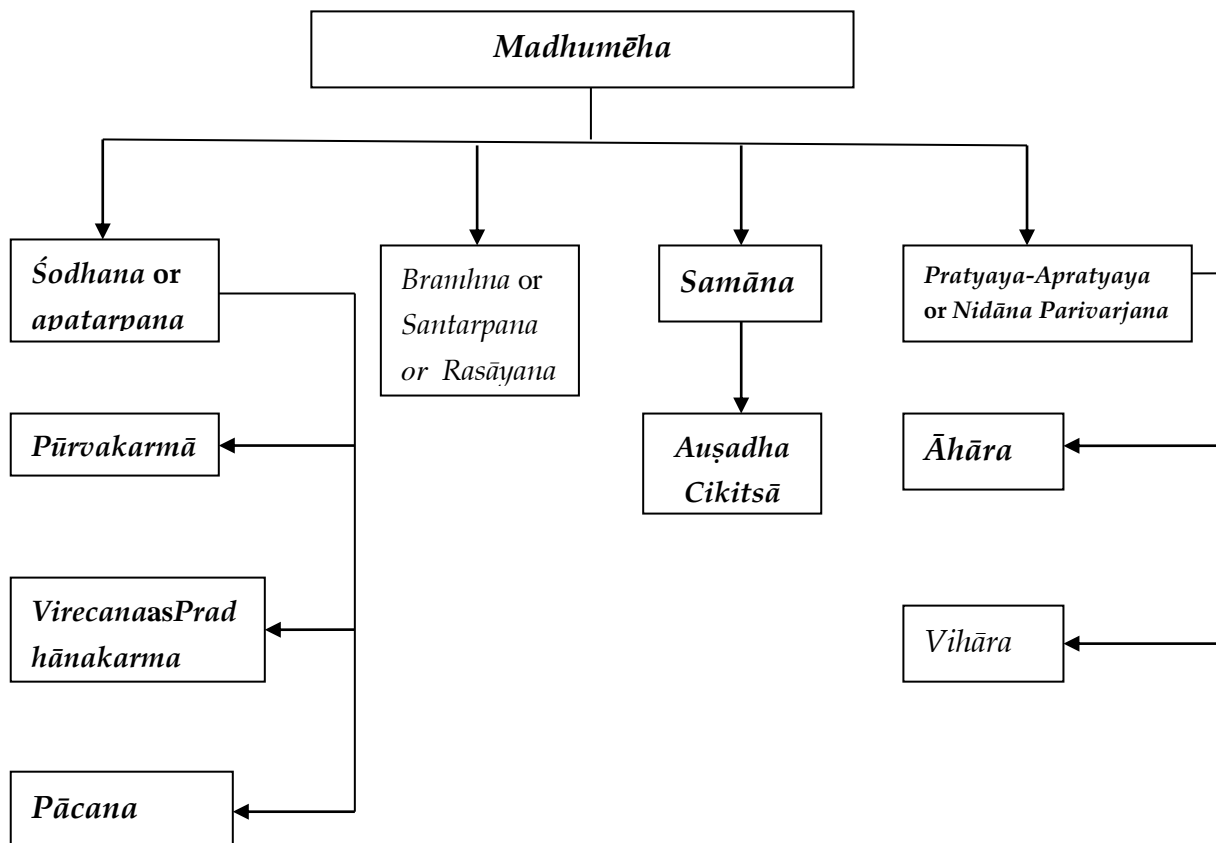
Śodhana: Ayurveda recommends *śodhana* (cleansing technique) in the management of *madhumēha* which involves *vamana*, *virecanā* and *basti* depending on the body constitution (*prakrati*) and disease severity (*vikrati*).

Samāna: After the cleansing procedures, the patient is advised to take someone *cikitsā* which includes oral medication in the form of tablets or *cūrṇa* (powder) for long term as maintenance dose.

Brahmanā: *Brahmanā* therapy is nourishing therapy this is recommended to the patients who are weak and underweight. In such cases, cleansing therapy (*Śodhana*) is not recommended as it leads to further weight loss and fatigue.

Pathyasevana: Along with medication, patients have to follow a specific lifestyle which includes regular physical activity (*Vyāyāma*), avoiding day time sleep (*Divyasvapna*), avoiding sweets and high calorie diet (*Guru, Madhu, Madhura, Snīgdhāhāra*).

Fig. 7: Principles of Āyurveda Chikitsa - Therapy for diabetes:



Management of diabetes by integrated approach of Yoga therapy

According to *Yoga* philosophy T2DM is a type of *sāmānya ādhijā vyādhi* which means the disease is born from stress caused by deep rooted psychological conflicts and uncontrolled emotions. Such a condition affects the *Prāṇamaya Koṣa* causing disturbance in functioning of *prāṇa* in the body; long term disturbed *prāṇa* function leads to disease in physical body (*Annamaya Koṣa*) called *ādhijā vyādhi*. *Yoga* recommends correction in lifestyle by following *yogic* lifestyle which emphasizes on moderation in diet, physical activity, sleep and healthy social relationship. *Yoga* therapy refers to application of *Yoga*. *Yoga* therapy works at different levels of personality. All *yogic* practices *āsana*, *prāṇāyāma*, meditation and relaxation techniques work at mental level and reduces stress response by down-regulating HPA axis. This helps in improving immune function and reduces systemic inflammation in the body. Evidences have shown that *Yoga* therapy improves most of these physiological functions and restores homeostasis.

Fig. 8: Model of homeostasis after Yoga Therapy Mechanism of Yoga therapy in type 2 Diabetes

<i>Manomaya Koṣa</i>	Reduction of Stress
<i>Prāṇamaya Koṣa</i>	Regulates the function of Hypothalamus, HPA axis
	Normalizes immune System function
<i>Annamaya Koṣa</i>	Reduced Inflammation
	Reduced Insulin Resistance
	Balance the platelets counts
	Improve β -Cell function
	Regulates glucose and Lipid Metabolism
	Metabolic Homeostasis

Table 6 below shows a comparative integrative model of understanding of T2DM according to modern allopathic medicine *āyurveda* and *Yoga*. Allopathy has been able to provide the mechanism of psychosocial stresses lead to psycho-neuro-immunological changes. *Yoga* understands these mental processes as persistent emotional responses which are characterized

by uncontrolled spinning speed that gets transmitted from the ‘mind body to ‘physical body’ through uncontrolled violent surges of ‘bioenergy body’.

Āyurveda elaborates this process of transmission of this violence or uncontrolled speed from ‘mind body’ to the ‘physical body’ by bringing in the concept of how this speed of the mind creates imbalance of the three energy systems (*doṣa*) that are always in dynamic balance and adapts itself to ensure healthy functioning of the tissues which is unique to each individual. If the lifestyle goes erratic for a long time, then the adaptation processes which had helped to maintain the homeostatic functioning of the tissues becomes a stable imbalance and creates toxins that accumulate in the tissues.

Looking at this model the first column depicts the pathophysiology as understood by the Allopathy system. The third column depicts the corresponding yogic pathophysiology and the middle column gives the details of *Āyurveda* ‘s way of understanding T2DM.

Integrative model of Etiopathogenesis of T2DM

Looking at the therapeutic models of the traditional systems:

The *yogika* understanding proposes that mastery over the uncontrolled speed that started in mind body due to ignorance is technique. This is done by the process of mindful slowing down that can reverse any degree of abnormality in all 3 levels namely the ‘mind body’, ‘bioenergy body’ and/or ‘physical body’ by using ‘knowledge body’ to dwell in ‘bliss body’. Mindfulness using the right knowledge of the intellect body (*Vijñānamaya Koṣa*) is the key to restore homeostasis.

The 3 processes that happen while doing *Yoga* practices that restore homeostasis are:

A). Release the locked-up bioenergy by stimulating practices (लये सम्बोधयेत चित्तम्।) such as *Kriyās, Āsana*, exercises and healthy diet; **B).** Slowing down (*praśamanaḥ*) through *prayatnaśaithilya* during all these practices including guided relaxation techniques, slow *Praṇāyāma*, meditation and **C).** Expansion (*anantasamāpatti*) which is possible while offering pure love to the divine through surrender (*Bhakti Yoga*) or during action in relaxation through retaining the inner expanded awareness of one’s true nature while in any

activity be it physical or mental or emotional (*Karma Yoga, Yoga sthaḥkuru Karmāṇi*); All these help in switching off all thoughts in the mind body and dwell in the inner ‘core body’ which is the seat of complete rest and healing. Exercising the will power of ‘knowledge body’ to master the surges of in ‘mind body’ is the key in *Yoga* therapy to reverse the habituated imbalances.

Āyurveda’s reversibility model offers 3 steps in the process of healing to achieve healthy homeostatic functioning of all tissues. A). *Śodhana*, cleaning or detoxification. The first step in detoxification is to clear the bowel and ensure one gets into the regular habit of emptying the bowel regularly as indicated by healthy soft stool that floats on water, emptied at least twice a day. Further, there are elaborate methods of detoxification of endotoxin (*āma*) that is deposited in the tissues through *pañcakarma*, of which *tīvra virecanā* has been recommended as the cleansing therapy for T2DM. This corresponds to *kriyās* which is done by self-effort in *Yoga*.

Śamana: This is the phase of resting which corresponds to *praśamanaḥ* at all levels. *Brahmana*: Rejuvenation of the tissues which in *āyurveda* is achieved through specific *harbala* medicines whereas *Yoga* strongly recommends deeper introspective mind silencing techniques to dwell in the awareness of deep rest in the sick organs.

Table 6: Integrative model of Etiopathogenesis of T2DM

Allopathy Psychosomatic diseases	<i>Āyurveda</i>	<i>Yoga</i>
Disturbed Life style Chronic stress ↓ Emotional responses to demanding situations	<i>Ājñā</i> <i>Mānasika Doṣa</i> <i>Prajñā Aparādha</i>	Manomaya Kosha (MMK) persistent Negative emotions = uncontrolled spinning speed of thoughts
Accumulation of visceral fat	<i>Sañcaya</i>	

Immune hyper-reactivity Imbalance at mind level	<i>Prakopa</i>				<i>Prāṇamaya K</i> Uncontrolled excessive prana flow in nadis ↓ <i>Ajīrṇatvam</i> <i>Atijīrṇatvam</i> <i>Kujīrṇatvam</i>	
	<i>Yoga</i>	Āyurveda – stage of Prasāra				
	<i>Mānasika Doṣa</i> mind level	Śārīrika Doṣa body level				
		<i>Kapha</i>	<i>Mahābhūta</i> elements level	<i>Mala</i> Waste produc ts level		
			<i>Dhātu</i> Tissue level			
	तमस <i>Tamas</i>	पित्त <i>Pitta</i>	<i>Jala Prthvī</i>	<i>Rasa Māṁsa Mēda Śukra</i> plasma, flesh, adipose, marrow/nerv. Reproductive tissue		<i>Mūtra Puriṣa</i> Urine, faeces
Rajasa <i>Sattva</i>	<i>Vāta</i>	<i>Agni</i>	<i>Rakta</i>			
Beta cell damage & Fat cell dysfunction - Adipokines	<i>Sthāna Samśraya</i>				Persistent spinning speed of prana ↓ constricts and leads to blockage of nadis	
IR=pre – DM	<i>Vyakta</i>				<i>Annamaya Kośa</i> Settles down in vulnerable organ as physically demonstrable disease	
T2DM and complications	<i>Bheda</i>				Organ damage	