

# ĀRYAVĀIDYAN

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the most precious is health*



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ESTD 1902

VAIDYARATNAM P.S. VARIER'S  
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**सतताध्ययनं वादः परतन्त्रावलोकनम् ।  
तद्विद्याचार्यसेवा च बुद्धिमेधाकरो गणः ॥**

Constant study, mutual discussion,  
learning other disciplines and close  
association with the preceptor - these factors  
endow one with intelligence and memory

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Back: *Nerium oleander*



## POLYPHARMACY - scope and concerns

Murali K.\*

Using several medicines together continuously is considered as polypharmacy. This is an umbrella term and definitions vary. But it is often regarded as simultaneous use of five drugs. In some contexts, the number is reduced to two. A drug added with another may increase or decrease its action or even cause adverse drug reactions (ADR).

Off course, multi-morbidity or having too many diseases is the main reason for poly pharmacy. This trend generally occurs in elderly persons<sup>[1]</sup>. As age increases, the number of chronic diseases affecting the individual also goes up. So, there is a simultaneous rise in medication. There is also a possibility for more number of drugs for single disease. Chances of ADR are more in elderly people due to significant metabolic changes. The drug clearance is also reduced in ageing. According to a case-control study carried out among old age people, in elderly it affects quality of life, decreasing the mobility and cognition. Polypharmacy was found to be an independent risk factor for hip fractures<sup>[2]</sup>. The clinical effects of drugs used together are not studied fully.

'Prescribing cascade' is another problem. ADR may be understood as the signs and symptoms of another disease and this prompts to prescribe more medicines. Side effects of combination of drugs are not easy to predict. Pharmacological profiles of individual drugs put together may not contribute to this. Interestingly, more number of prescribers without coordination especially in a multi specialty centre can also contribute to polypharmacy. There is an experience of a prescription with twenty three drugs for single patient who came out after consultation at such a centre.

Polypharmacy cannot be considered as overmedication always. Too many diseases require too many medicines also. But to de-prescribe (reduce medications) may not be a simple task. It requires clinical wisdom. Physician has to look into the pros and cons of each medication. Appropriate prescription is the only way to limit polypharmacy (appropriate polypharmacy). Evidence is the only source for such a step.

Simultaneous use of drugs of different systems also poses problems. It is usual for the patients to approach *ayurveda* for some complaints while they are taking medications regularly for some other disease. It is generally considered that ayurvedic medicines are weaker than drugs of conventional system and are not supposed to interact with drugs of conventional medicine. Some physicians suggest more time gap between the intake. Whether the medicines are having same or different receptor site is something to be counted. It has been proposed that in most of the cases the absorption is altered due to drug-to-drug interactions. Many of the single drugs like *guggulu*, *rasona*, *sunthi*, *jataamaansi*, *yashṭimadhu*, *eeranda*, *kapikacchu* and *vaasa* do interact with drugs of conventional medicines. Interestingly all of these potentiate the action

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of the drugs with same indication in conventional medicine. It is also known that the side effects of spironolactone is reduced if *yashṭimadhu* is used simultaneously<sup>[3]</sup>. In another study where combination of Aswagandharishtam and Parthadyarishtam does not interact with the drugs prescribed for cardiac and associated ailments<sup>[4]</sup>. More is to be explored in these lines. No major finding related to a negative drug interaction is available so far. That does not reduce the importance of pharmaco-vigilance in this particular area.

Constant monitoring of these patients may be followed by physicians. Detailed history is to be taken with emphasis on drug history. The dose and mode of intake may be meticulously planned in those who are on conventional medication. Research agencies or professional associations may initiate preparation of database on drug interactions. There is an abundant scope for pharmacological studies on the commonly involved drugs in polypharmacy.

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## Taxonomical identification of *Jalauka* used for *raktamoksha* in Kerala

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**ABSTRACT:** According to *ayurveda* *raktamoksha* is one among the *sodhana* therapy. *Jalaukaavacarana* is the simplest form of *raktamoksha* and one among *anusastra-karma* which is indicated in *pitta* predominant conditions. It is easy, cost effective and safe to use. *Acaarya* *Susruta* has detailed the morphological features of poisonous and non poisonous leeches. There are more than 700 species identified so far at global level. Out of them *Hirudo medicinalis*, *Hirudo nipponia*, *Hirudo troctina*, *Hirudo quinquestriata*, *Hirudinaria javanica*, *H. manillensis*, *Poecilobdella granulosa*, *Macrobdeella decora*, *Hirudo verbena* and *Haementeria officinalis* are most commonly used in clinical practice<sup>[1]</sup>. The families found in India are Piscicolidae, Glossiphonidae, Erpobdellidae, Hirudidae, Haemadipsidae and Ozobranchida<sup>[2]</sup>. Among them medicinal leeches in general are expected to belong in the species *Hirudo medicinalis*.

The present study was done for the species determination of commonly used *jalauka* from different areas of Kerala. For that, the leech samples were collected from 17 different Ayurveda colleges in Kerala and three natural habitat zones. The leech samples were put in separate bottles and clearly labelled (Designated sites as A1 to A20). The samples were morphologically identified. All the specimens were examined morphologically and it was found from detailed study that the specimens belonged to the Genus “*Hirudinaria*” and species “*bpling*”, *Hirudinaria bpling*.

**Key words:** *Jalauka*, Medicinal leech, *Hirudinaria bpling*, Kerala

### Introduction

Medicinal leech therapy or hirudo therapy is a kind of complementary treatment method applied with non poisonous leeches. One or more leeches are attached to the skin of affected area and the purpose is to gain potential utilities of leech saliva that is secreted.

There are more than 700 species identified so far at global level. Out of them *Hirudo medicinalis*, *Hirudo nipponia*, *Hirudo troctina*, *Hirudo quinquestriata*, *Hirudinaria javanica*, *H. manillensis*, *Poecilobdella granulosa*,

*Macrobdeella decora*, *Hirudo verbena* and *Haementeria officinalis* are most commonly used in clinical practice. The families found in India are Piscicolidae, Glossiphonidae, Erpobdellidae, Hirudidae, Haemadipsidae and Ozobranchida. Among them medicinal leeches in general are expected to belong in the species *Hirudo medicinalis*.

Ayurvedic classics also provide a detailed description on leech therapy; *Acaaryas* include it under the heading of *raktamoksha* which is one among the *pancakarma*.

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*Aacaarya* Suśruta details twelve types of *jalaukaa*. Among them six are *savisha* and six are *nirvisha*<sup>[3]</sup> (see tables 1,2). The category has been decided by their habitat and morphological features. Leeches dwelling in places having plenty of clean water and fragrance, water sources having lotus, lily, other fragrant flowers and algae are non poisonous. The poisonous ones live in dirty water contaminated by putrefied bodies and also by excretion of snakes, frogs, fish and other aquatic animals. Generally, the leeches which are

expanded in the middle, which are ugly, flat or dull in movement and which do not stick well, suck little blood are unfit to use. Those having coloured, white or too black, very thin or thick, very much mobile and slimy, stout and hairy in the middle or having streaks of varied colours like a rainbow, are of poisonous variety. Their bites cause oedema, excessive itching, pyrexia, burning sensation, vomiting, feeling like intoxication and sinking. Therefore these must not be used for the therapeutic purposes<sup>[3]</sup>. The names and

Table 1

*Savisha-jalaukaa*

<i>Savisha-jalaukaa</i>	Features
1. Kṛshṇā	Colour of antimony powder and big head
2. Karburā	Snake like and has abdomen depressed and elevated
3. Alagardā	Hairy, has broad flanks and black mouth
4. Indrāyudhā	Variegated like rainbow with upward streaks
5. Saamudrikā	Slightly black-yellow variegated with various flower marks
6. Gocandana	Bifurcated in lower part like bull's scrotum and with small mouth

Table 2

*Nirvisha-jalaukaa*

<i>Nirvisha-jalaukaa</i>	Features
1. Kapilā	Flanks looks like painted with realgar, unctuous back, colour like green gram
2. Pingalā	Slightly red with round body, brown and swiftly moving
3. Śankhamukhi	Livery colour, swiftly sucking and with long sharp mouth
4. Mooshikā	Appearance and colour that of rat with disagreeable smell
5. Pundareekā mukhi	Colour like that of green gram and mouth like that of lotus
6. Saavarikā	Unctous with colour like that of lotus and eighteen fingers in length, applicable in animals

morphological features of the leeches as explained by *Aacaarya* Suśruta are as stated below in the table.

Tracing the literature, it is clear that an abundant collection of study references are available pertaining to medicinal leech identification and its utility in therapeutics. But scientific identification of the medicinal leeches based on morphology and taxonomy is mandatory for bringing up a standard protocol for leech therapy especially in ayurvedic practice, where leech therapy is widely used. In ayurvedic texts detailing of the non-poisonous leeches are done mainly based on their colour and length. But this information is deficient in specific and accurate identification of the leeches. So as

a stepping stone for bring a standardized parameters for medicinal leeches, this study aims to morphologically and taxonomically identify medicinal leeches used in different areas of Kerala.

### Materials and methodology

Sample collection: For morphological and taxonomical identification:

Leech samples, two each in number, were collected from 17 Ayurveda colleges registered under KUHS. Besides these, two samples each were also collected from three main natural habitat zones of Kerala namely - Aakulam lake (Trivandrum), Attapady (Palakkad) and Kaattikkulam (Waynad).

### Morphological and taxonomical identification of the leech samples

Samples used in present study included 58 leeches from 20 sampling sites designated A-1 to A-20. All the specimens were examined morphologically and in taxonomic identification it was found that the specimens belonged to the Genus “Hirudinaria” and species “bpling”, *Hirudinaria bpling*. The two forms of this Asian buffalo leech; the Asian buffalo leech and the dark Asian buffalo leech were observed from the 20 different sampling sites under study. Though variations in pigmentation are observed for both the Asian buffalo leech and the dark Asian buffalo leech, both fall under the same species name *Hirudinaria bpling*.

### Observations of the specimen analyzed

#### Sample A - 1

4 samples were studied and 4 of them though different in size were identified as Asian buffalo leech, *Hirudinaria bpling* (Fig 1)

Fig 1: Sample observed from Site A-1 (showing ventral view) adhered to bottle with anterior and posterior suckers.



#### Sample A - 2

3 samples were studied and all the 3 samples were olive Asian pigmented with lateral yellow markings belonging to Asian buffalo leech –*Hirudinaria bpling* (Fig: 2).

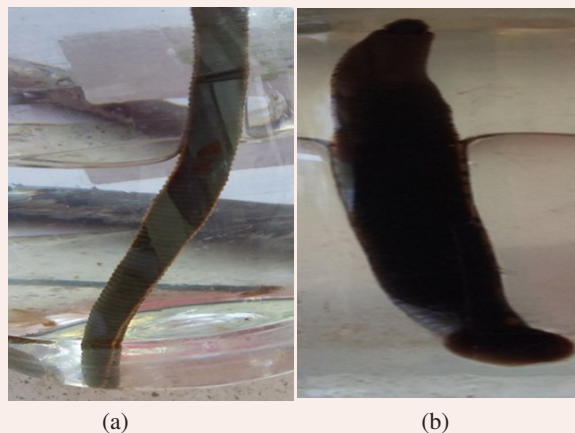
Fig 2: Sample attached to bottle using its posterior sucker



#### Sample A-3

Only one sample was studied from this site and the specimen is Asian buffalo leech –*Hirudinaria bpling* (Fig : 3).

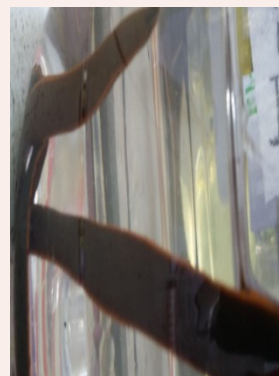
Fig 3 : a) Ventral view of the sample showing elongated/ stretched body of the organism. b) Same sample attached to bottle with its anterior and posterior sucker.



#### Sample A – 4

3 samples were studied. More or less of uniform size. Dark Asian buffalo leech-*Hirudinaria bpling* (Fig : 4).

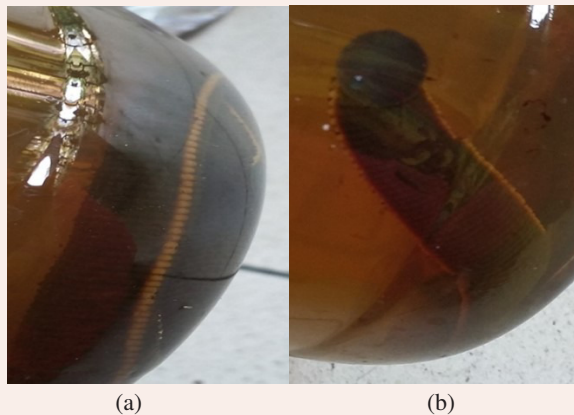
Fig 4: Picture showing three of the samples under study



**Sample A – 5**

3 samples were studied. Dark Asian buffalo leech -*Hirudinaria bpling* (Fig : 5).

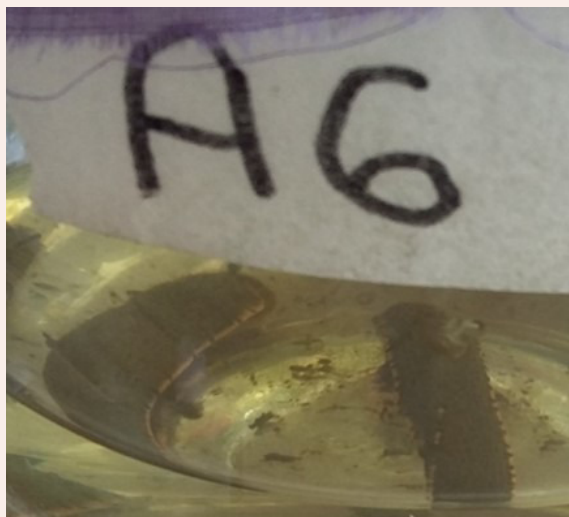
Fig 5 : a) showing lateral view of the specimen  
b) showing ventral view of the specimen clinging to bottle with posterior sucker



**Sample A – 6**

3 samples were studied. Dark Asian buffalo leech -*Hirudinaria bpling* (Fig : 6).

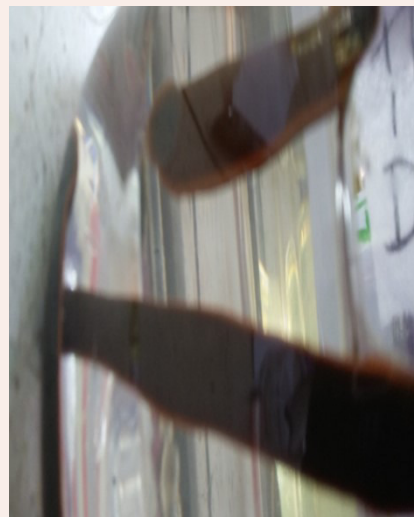
Fig 6: Dorsal view of the two specimens studied



**Sample A – 7**

4 samples were studied. Dark Asian buffalo leech -*Hirudinaria bpling* (Fig: 7).

Fig 7: Ventral view of three of the specimen studied from A-7



**Sample A – 8**

3 samples were studied. Dark Asian buffalo leech -*Hirudinaria bpling* (Fig:8).

Fig 8: Showing the dorsal view of the three specimen under study from site A -8



**Sample A – 9**

2 samples were studied. Dark Asian buffalo leech -*Hirudinaria bpling* (Fig : 9).

Fig 9 : Showing the ventral view of the two specimen studied at site A – 9.





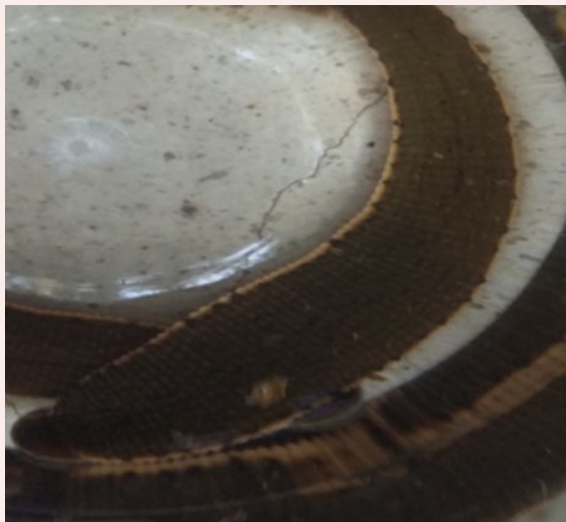
**Sample A – 10**

3 samples were studied. Dark Asian buffalo leech -*Hirudinaria bpling* (Fig : 10).

Fig 10: a) showing ventral view of the specimen studied b) showing dorsal view of specimen studied



(a)



(b)

**Sample A – 11**

3 samples were studied. Dark Asian buffalo leech -*Hirudinaria bpling* (Fig : 11).

Fig 11 : a) showing dorsal view of specimen  
b) showing ventral and dorsal view of specimen



(a)



(b)

**Sample A – 12**

3 samples were studied. Asian buffalo leech -*Hirudinaria bpling* (Fig : 12).

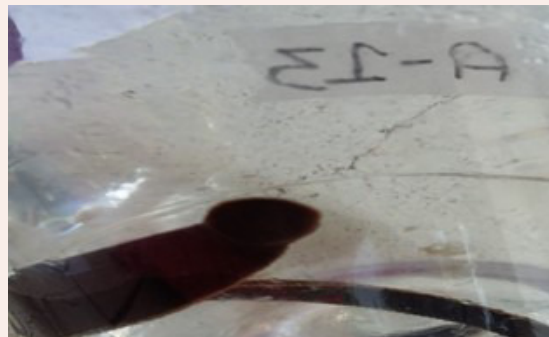
Fig 12: Dorsal view of the specimen studied from site A-12



**Sample A – 13**

2 samples were studied. Dark Asian buffalo leech -*Hirudinaria bpling* (Fig : 13).

Fig 13: Ventral view of specimen studied from site A-13



**Sample A – 14**

4 samples were studied. Dark Asian buffalo leech -*Hirudinaria bpling* (Fig : 14).

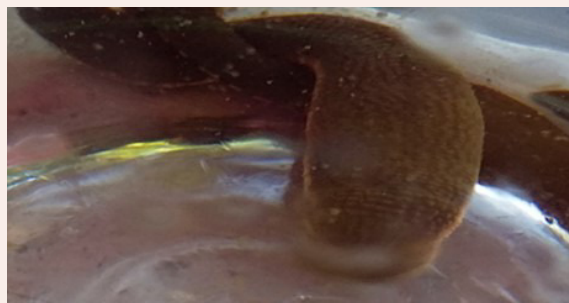
Fig 14: Dorsal view of the specimen studied from site A -14



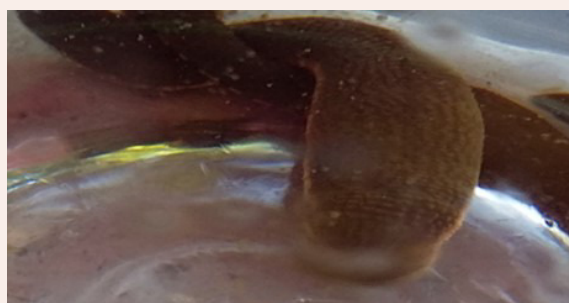
**Sample A – 15**

2 samples were studied. Asian buffalo leech - *Hirudinaria bpling* (Fig : 15).

Fig 15: Showing posterior sucker and dorsal view of the specimen studied from site A – 15



(a)



(b)

**Sample A – 16**

3 samples were studied. Dark Asian buffalo leech -*Hirudinaria bpling* (Fig : 16).

Fig 16 : Showing ventral view of the specimen studied from site A -16



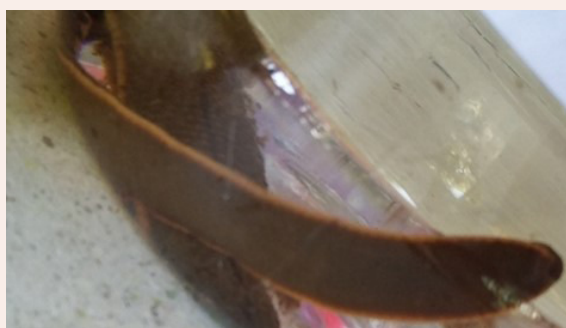
**Sample A – 17**

3 samples were studied. Dark Asian buffalo leech -*Hirudinaria bpling* (Fig : 17).

Fig 17 : a) showing the three specimen studied b) showing the ventral view of one of the specimen studied from site A – 17



(a)



(b)

**Sample A – 18**

2 samples were studied. Asian buffalo leech - *Hirudinaria bpling* (Fig : 18).

Fig 18 : Showing the dorsal view of the sample



**Sample A – 19**

3 samples were studied. Asian buffalo leech - *Hirudinaria bpling* (Fig : 19).

Fig 19: Dorsal view of the specimen studied from site A – 19



**Sample A – 20**

3 samples were studied. Dark Asian buffalo leech - *Hirudinaria bpling* (Fig :20).

Fig. 20 : a) Specimen studied from site A-20  
b) Dorsal view



(a)



(b)

**Morphological features**

Of the 58 leeches examined, the body was cylindrical, dorsoventrally flattened divided into thirty-four segments and 102 annuli having an anterior sucker and a posterior sucker.

The body of the dark brown leech was observed to have dark brownish body colour with a dark black stripe mid dorsally, which extended from anterior end to posterior end of the body. Black lines forming square pattern were also observed along the either sides of this mid dorsal line. Yellow stripes on lateral side and light brown colour on ventral side (Fig 21 a & b).

The lines of black spot pattern of the body were observed to spread from the middle line and becoming less prominent towards the lateral side.

Fig. 21 : a) Dorsal view of Asian buffalo leech  
b) Ventral view of Asian buffalo leech



(a)



(b)



As for Asian leech, the dorsal colour was dark Asianish, dark olive, or dark brownish. It also contains longitudinal, black or grey, mid-dorsal stripe. Next to the mid dorsal stripe, there are two longitudinal lines with orange yellowish colour at the lateral side of the body. Between the orange yellowish margin and the mid-dorsal stripe on each side, there are 3-4 narrow and more or less broken stripes, of the dark brown or dark olive dorsum. For the ventral side, the colour pattern is fully dark brown in colour (Fig. 22).

Fig 22 : Doral view of Asian buffalo leech



Both dark brown leech and Asian leech have at least 10 eyes which are arranged in pairs of 2. The eyes can be observed under the microscope as multiple large black spot on the head arranged in parabolic arc. Five pairs of eyes are located on dorsal side towards the lateral side which is arranged closely for the first 3 pairs starting at 2nd annulus to 4th annulus. Meanwhile, the 4th pair is located on the 6th annulus and the last pair is located on the 9th annulus.

Both dark and Asian buffalo leech had 102 annuli. Annulus found at the middle of the body was larger compared to the annulus at the end of the body. Both types were observed to have papillae on the body surface which appear as small protruding stub on the dorsal side of the body, that give the body its rough appearance on its dorsal side (Fig. 23 a & b).

Fig. 23: a) Lateral view of *Hirudinaria bpling* showing the arrangement of papillae on its body b) Dorsal view of *Hirudinaria bpling* showing the arrangement of papillae giving the organism a rough appearance



(a)



(b)

The jaws of *Hirudinaria bpling* are relatively small, rounded and soft, rough-surfaced teeth, and arranged in a Y-shape. The Y-shape arrangement is referred to the three pointed star (Fig. 24 a, b & c).

Fig. 24 a: Anterior sucker exhibiting the jaws arranged in Y shape





Fig. 24 b: Anterior sucker as seen in dorsolateral view



Fig. 24 c: Anterior sucker as seen in lateral view



Fig. 26a : Caudal sucker with posterior somites of the body.



Fig. 26 b : Dorsal view of caudal sucker with posterior somites of the body



The number of segments is 34 and remains constant in the group irrespective of size of the organism (Fig. 25). They are designated by the Roman numerals and are grouped into five or six well marked regions. The head or cephalic region is represented by segments I to VI (Fig. 26); preclitellar region includes 3 segments, VII to IX ; the middle body region is represented by 5 segments, X to XXIV which is further subdivided into clitellar or genital region of somites(X to XIII) and post clitellar region of 11 segments(somites XIV to XXIV); the anal region of XXV to XXVII; and the caudal region or sucker of somites is seen from XXVIII to XXXIV (Fig. 26a & 26b).

Fig. 25 : Head or cephalic segment.



## Results

The specimen obtained from the 20 sites of study belong to the species "*Hirudinaria bpling*".

## Discussion

*Aacaarya* Suśruta has given a detailed description on the morphology of leeches. He has classified leeches into poisonous and non poisonous ones. Non poisonous leeches are used for blood letting procedures. Use of poisonous leeches results in many complications and adversely affects the patients. This highlights the importance of right selection of leeches used for the treatment. *Aacaarya* Suśruta details six varieties of non poisonous and six varieties of poisonous leeches. A more scientific explanation is the need of the hour; this compels to make a detailed study of the leeches used for ayurvedic treatment. Treatment efficacy depends on correct selection of non toxic leeches and its precise use.

In this study, the type of leeches used for treatment in different regions of Kerala was identified as *Hirudinaria bpling*. The body of the dark brown

leech was observed to have dark brownish body colour with a dark black stripe mid dorsally which extended from anterior end to posterior end of the body. Yellow stripes were found on lateral side and light brown colour on ventral side. As for Asian leech, the dorsal colour was dark olive, or dark brownish. There were longitudinal lines with orange yellowish colour at the lateral side of the body. In fact, both the dark brown leech and the Asian Buffalo leech show close resemblance with the features explained by *Acaarya* Suśruta in the context of *nirvisha jalaukaa*. The *kapilaa* type of *nirvisha jalaukaa* has its flanks looks painted with realgar colour, unctuous back, colour like green gram. Thus, the scientific study on medicinal leeches parallels with a ayurvedic textual reference on leeches.

As already seen, descriptions given in ayurvedic classics are mostly based on the colour and length of the leeches. But this is a bit vague. The identification of the leeches based on its colour, number of annuli and jaws, makes the selection of medicinal leeches more vivid and specific. This can effectively prevent the complications to patients that arise on using poisonous leeches. Generally the leeches used for treatment are scientifically coined as *Hirudo medicinalis* and believed to drink non oxygenated or vitiated blood from the diseased. Ayurvedic practitioners widely use the leech therapy for the treatment of various diseases and consider that the leech species used belonged to *Hirudo medicinalis*. But the findings of the study proved that the species named

*Hirudinaria bpling* which included dark brown and Asian buffalo leeches are being used effectively for leech therapy in *ayurveda*. This is an important outcome measure of the study and gives a scientific alignment to the leech therapy in *ayurveda*.

### Conclusion

The leech specimens collected from different areas of Kerala were examined morphologically and taxonomic identification was done. The specimens belonged to the Genus "*Hirudinaria*" and species "*bpling*", *Hirudinaria bpling*. The two forms of this Asian buffalo leech, the Asian buffalo leech and the dark Asian buffalo leech were observed from the 20 different sampling sites under study. Though variations in pigmentation are observed for both the Asian buffalo leech and the dark Asian buffalo leech, both fall under the same species name "*Hirudinaria bpling*".

### Acknowledgement

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## Management of *dushtavrana* according to its cause - A study series

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**ABSTRACT:** The most common underlying problem causing chronic leg ulcers is the disease of the veins of the leg. Precipitating factors are venous stasis and tissue anoxia. Sustained venous pressure results in extravasation of cells, activation of capillary endothelium resulting in release of free radicals. Studies have shown unrestrained matrix metalloproteinase activity in venous ulcer fluid has significant anti-angiogenic effects and disrupt the microcirculation in the perivascular regions thereby inhibiting wound healing. In *ayurveda*, chronic wounds are considered as *dushtavrana*. There are no specific causes mentioned but are said to occur due to *pravardha dosha*. Here, in order to plan an effective protocol, *dushtavrana* was considered as due to *siraajagranthi*, so as to deal with the root cause of the *vrana* formation. The protocol of *rotasshodhana- vrana srotassodhana and ropana-rasaayana* used here in five cases of *dushtavrana* probably helped to improve the circulation- reduce stasis and thereby improve healing.

**Keywords:** *dushtavrana, siraajagranthi, srotassodhana, vrana sodhana- ropana*, chronic venous ulcer, venous stasis.

### Introduction

Chronic venous disorders are an important cause of disease and disability worldwide<sup>[1]</sup>. They are characterised by associated skin trophic changes such as pigmented dermatitis lipodermatosclerosis leg ulcers and pitting oedema, along with symptoms of venous dysfunction such as aching pain, congestion, skin irritation and muscle cramps<sup>[2]</sup>.

Literature lacks a correct estimation of prevalence and incidences of venous ulcers in India. In a study carried out in North Indian population, the authors estimated that prevalence of varicose veins as around 46.7% in females and 27.8% in males, while skin trophic changes were observed in 18.9% females and 5.2% males respectively<sup>[3]</sup>.

Current treatment strategies for venous ulcers involve use of compression therapy in combination

with advanced wound dressings. Additionally, debridement, topical application of antimicrobial agents and periodic rebandaging have also shown to accelerate wound closure, although once healed, 70% of patients suffer an ulcer relapse<sup>[4]</sup>.

Ayurvedic principle of treatment involves identifying the various entities of *sampraapti* or disease manifestation process and attempt at its disruption or *sampraapti vighattanam*<sup>[5]</sup>.

In order to plan an effective protocol of management, *dushtavrana* was considered here as due to *siraajagranthi*, so as to deal with the root cause of ulcer formation.

Here, 5 cases of venous ulcers were dealt with a common protocol aiming at initial *rotassodhana* followed by *vrana sodhana* and *ropana* and finally by *rasaayana*..

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## Literature review

Generally varicose veins are considered to be *siraaajgranthi* in *ayurveda*, caused by *vaatakopa* affecting *siraa* filled with *rakta* causing *siraasankoca* (construction or constrictions over the *siraa*), *vakrikarana* (tortuosity) leading to *unnata vrta granthi* (raised and dilated segments of *siraa*) similar to a varicose vein<sup>[6]</sup>.

Looking into the *shatkriyaa kaala* in the fifth *kriyaa kaala* ie., *vyakti*, symptoms of diseases like *sopha*, *arbuda*, *granthi*, *vidradhi*, *visarpa* as well as *jwara*, *atisaara* and so on manifest clearly<sup>[7]</sup>. As it further proceeds into sixth *kriyaa kaala* ie. *bheda*, *upadravas* are seen either breaking open to a wound or chronicity<sup>[8]</sup>. Acaarya Dalhana explains that *avadeernatwam* or *vranabhaavam aapannam* is a *visesha lakshana* of *sophadi roga* (*sopha*, *granthi*, *vidradhi*, *visarpa*)<sup>[9]</sup>. This is said to occur due to improper management in *sancayaadi* course of *shatkriyaa kaala*<sup>[9],[10]</sup>.

Generally, *dushtavrana* treatment includes *oordhwa- adha sodhana*, *langhana*, and *raktamokshana*<sup>[11]</sup>. By considering *sirajaajgranthi* as root cause of the formation of *dushtavrana* this general protocol may not be sufficient, as mere treating the *upadrava* without dealing with the cause can lead to recurrences.

Thus, here the treatment was planned under 3 stages- initial *srotasodhanam* to remove *srotorodham* and clear channels of *vyaana vaata* circulation. Next *vrana sodhana* and *ropana* and finally *rasaayana* to prevent a recurrence.

## Aims and objectives

To plan a protocol for the management of *dushtavrana* due to *siraaajgranthi*.

## Methodology

5 cases of *dushtavrana* due to *siraaajgranthi* were treated by using a common protocol consisting of *srotasodhanam* followed by *vrana sodhana* and *ropanam* and finally *rasaayana*.

When CEAP classification<sup>[12]</sup> was applied to the 5 cases:

Table 1 CEAP classification of wound					
	Case 1	Case 2	Case 3	Case 4	Case 5
Clinical manifestation	C <sub>6</sub>	C <sub>6</sub>	C <sub>6</sub>	C <sub>6</sub>	C <sub>6</sub>
Etiological factors	E <sub>P</sub>	E <sub>P</sub>	E <sub>P</sub>	E <sub>S</sub>	E <sub>P</sub>
Anatomical distribution	A <sub>s</sub>	A <sub>s</sub>	A <sub>s</sub>	A <sub>s</sub>	A <sub>s</sub>
Pathophysiological conditions	P <sub>R</sub>	P <sub>R</sub>	P <sub>R</sub>	P <sub>O</sub>	P <sub>R</sub>

CEAP classification was used to understand the diagnosis but to assess the before treatment and after treatment conditions better, a few criteria were selected:

1. Wound size
2. Pus discharge / oozing

3. Presence of unhealthy granulation tissue
4. Itching
5. Oedema over lower limb
6. Tenderness
7. Discolouration of surrounding skin

Medicines given under the 3 stages were:

Table 2 Protocol followed		
	Internally	Externally
Stage 1: <i>SROTASSHODHANA</i>	<p><b>i. Brihat manjishtadi kwatham</b> 15ml diluted with 45 ml boiled and cooled water twice daily before food.</p> <p><b>ii. Guggulu pancha pala choornam</b> 5g with kashayam twice daily before food.</p> <p><b>iii. Rasa sindhuram</b> 125 mg with 10 drops of <b>Gandharvahasthadi erandam</b> and a pinch of <b>saindhava</b> twice daily after food.</p>	<p><b>i. Local dhaara</b> with <b>Ksheeri vrksha kwatha</b> daily once and <b>veshtana</b> to keep dry</p> <p><b>ii. Jalookaavacaarana</b> on alternate days</p>
Stage 2: <i>VRANA SODHANA AND ROPANA</i>	<p><b>i. Thiktakam kwatham</b> 15 ml with 45 ml boiled and cooled water twice daily before food.</p> <p><b>ii. Guggulu pancha pala choornam</b> 5gms with honey Twice daily Before food</p> <p><b>iii. Rasa sinduram</b> 125 mg with <b>honey</b> OD HS</p>	<p><b>i. Veshtana</b> with <b>Jathyadi Ghritham</b> over wound</p> <p><b>ii. Dusting Sodhita Tankana</b> over swollen limb apart from wound</p> <p><b>iii. Jalookaavacarana</b> once in 4 days</p>
Stage 3: <i>RASAAAYANA</i>	<p><b>i. Mahatikthakam ghritham</b> 10 g BD BF</p>	<p><b>i. Lepam</b> with <b>Shathadhoutha ghritham + yashada bhasmam</b></p>

Period varied for each patient as the wound size and characteristics varied, the maximum time taken being 4 months.

## Cases

### Case 1

42 years old businessman came to OPD on 4/2/18 with complaints of wound over the right lower leg for 6 months. Took modern medicine treatment and got relief temporarily. He needs to travel constantly which leads to swelling over the (R) Lower limb. Now for the past 2 weeks, wound formed which increased in size due to lack of proper care. No h/o trauma or associated illness. He was subjected to the treatment protocol and duration of treatment was 52 days. He was advised on proper wound care and use of crepe bandage during long travel to help reduce oedema formation during traveling. Detailed wound examination mentioned in table no. 3.

### Case 2

48 years old woman (a tailor by profession) came to OPD on 17/12/17 with wound over medial side of ankle joint (R) and over dorsum of foot for 2 months. No h/o recent trauma or any associated

major health issues. No prominent tortuous veins seen over (R) lower limb but skin hardening with discolouration over ankle joint along with telangiectasia over the lower calf region and over foot. Scars of previous occurrences also seen. Wound developed 2 years ago and took modern medicine as well as homeopathic treatment but recurrences occurred due to lack of proper rest. 2 months ago following itching over the foot, she developed small wound over the dorsum of foot but due to work overload she did not go for treatment. Now pain and swelling developed along with a wound over medial side of the joint with oozing and itching. She was advised rest for initial period of treatment till oozing stopped and wound healing started. Duration of treatment was 41 days. She was advised proper rest and wound care to prevent another attack. She was advised to keep legs elevated frequently to prevent accumulation of swelling again. Detailed wound examination mentioned in table.

### Case 3

56 years old manual worker came to OPD on 26/11/17 with a chronic wound over the medial side of the (R) ankle for last 3 years and development



of pain since 1 week back. He uses bicycle and reported trauma over the area during a fall from the bicycle. He has h/o varicose veins for around 7 years. Though bleeding was arrested, he later developed a wound over the site which gets worse at times. He took modern medicine consultation and got temporary relief. Now for one week, he has developed pain and difficulty of movement of ankle joint. He was advised treatment and duration of treatment was 84 days. He was advised to keep legs elevated after returning from work. Detailed wound examination mentioned in table below.

**Case 4**

48 years old male who works as a waiter at a hotel came to OPD on 15/10/17 with wound over medial side of (L) ankle since 1 month. He has h/o muscle cramps often at night since many years before with telangiectasia over the ankle joint for 10 years. 2 years ago he developed swelling and pain over calf which did not subside on rest with legs kept elevated. He consulted a physician who diagnosed it as DVT and was given treatment accordingly. He continued the same treatment for around a year and stopped by himself. By his long

hours of standing, varicosities worsened. He developed wound after a fall 1 month ago. Wound healing was found delayed and on testing, RBS was found to be 152mg/dl which he has brought to normalcy through diet modifications. He was advised treatment and duration of treatment was 80 days. He was advised to use crepe bandage when standing for long periods of time. Detailed wound examination mentioned in table below.

**Case 5**

58 years old housewife came to OPD on 21/1/18 with c/o wound over medial aspect of (L) ankle joint for 6 years. She had h/o varicosities for the last 15 years. Following an episode of itching, the wound burst open and it healed after treatment. It however would come frequently and each time modern medicine treatment sought. Now since past few weeks the wound reoccurred and has become bigger and painful. No associated comorbidities reported. She underwent the treatment for a duration of 117 days (approx. 3 and ½ months). She was advised use of crepe bandage as well as to keep legs elevated frequently to prevent formation of swelling. Detailed wound examination mentioned in table below.

Table 3 Before treatment assessment					
	Case 1	Case 2	Case 3	Case 4	Case 5
Wound site	Medial malleolus (R)	Medial malleolus (R) & 1cm from it	Medial malleolus (R)	Medial malleolus (L)	Medial malleolus (L)
Wound number	1	2	1	1	1
Wound size	4cm×4cm×0.25cm	Medial malleolar-4cm×2cm×0.25cm Dorsum- 2cm×3cm×0.25cm	3cm×3cm×0.5cm	1cm×2cm×0.25cm	6cm×5.2cm×0.5cm
Pus discharge / oozing	Absent	+ in both	Absent	+	+
Presence of unhealthy granulation tissue	+	+	+	+	+ hypergranulation tissue over edge of wound
Itching	+	+	Absent	Absent	+
Oedema over lower limb	+	+	Mild	+	+
Tenderness	+ skin around wound	+ in and around both wounds	+ around wound	+ around wound and ankle joint	+ around wound
Discoloration of surrounding skin	+	+	+ with thickness and dryness of skin	+ with skin thickening	+ skin thickness +

Table 4 After treatment assessment					
	Case 1	Case 2	Case 3	Case 4	Case 5
Healed Wound site	Medial malleolus (R)	Medial malleolus (R) & 1cm from it	Medial malleolus (R)	Medial malleolus (L)	Medial malleolus (L)
Wound number	1	2	1	1	1
Healed Wound / scar size	4cm×3cm×0cm	Medial malleolar- 3cm×1cm×0cm Dorsum- 0.75cm×1cm×0cm	2cm×1.5cm×0cm	0.5cm×0.5cm×0cm	4.8cm×3.2cm×0.25cm
Pus discharge / oozing	Absent	Absent	Absent	Absent	Absent
Presence of unhealthy granulation tissue	Nil	Nil	Nil	Nil	Nil, slightly raised healing granulation tissue over edges of scar
Itching	Absent	Absent	Absent	Absent	Absent
Oedema over lower limb	Absent	Absent	Mild	Reduced	+ reduced
Tenderness	Absent	Absent	Absent	Absent	+ over heels
Discoloration of surrounding skin	Reduced discolouration	+	+ with thickness and dryness of skin but reduced	+ thickness reduced	+ skin thickness +

Fig 1



Case 1a- before treatment      Case 1b- after treatment

Fig 2



Case 2a- before treatment      Case 2b- after treatment

Fig 3



Case 3a- before treatment      Case 3b- after treatment

Fig 4



Case 4a- before treatment      Case 4b- after treatment

Fig 5



Case 5a – before treatment

Case 5b- after treatment

## Discussion

Venous ulcers are also called gravitational ulcers. Precipitating factors are venous stasis and tissue anoxia. Sustained venous pressure results in extravasation of cells, activation of capillary endothelium resulting in release of free radicals<sup>[13]</sup>. Studies have shown unrestrained matrix metalloproteinase activity in venous ulcer fluid have significant antiangiogenic effects and disrupt the microcirculation in the perivascular regions thereby inhibiting wound healing<sup>[14]</sup>. Similar high concentration of thrombin has a negative impact. Fibrin bound thrombin not only decreases proliferation of tissues but also induces normal human epidermal keratinocytes apoptosis when present in high concentration<sup>[15]</sup>.

During course of this treatment, main focus was to remove the *srotorodham* and improve the circulation which is a critical entity for wound healing- *vraṇa śodhana* and *ropāna*.

### Stage 1 - *Srotassodhana*

#### Internally

Brihat Manjishtadi Kwatham<sup>[16]</sup> for its *tridosha-hara* property added with Guggulupanchapala Chooranam<sup>[17]</sup> instead of *prakshepa* of *kanaa* and *guggulu*, provides additional properties of *lekhana*, clearing of channels and anti-inflammatory action.

**Rasa Sindooram**<sup>[18]</sup> which acts as vasodilator also augments action of other medicines; here given with Gandharvahasthadi Erandam<sup>[19], [20]</sup> and Saindhavam<sup>[21]</sup> to provide *vaatahara- vaata anulomana* action with *sookshma* property.

Externally:

Daily local *dhaara* with Ksheerivriksha Kashayam<sup>[22]</sup> to remove unhealthy tissues and reduce *pitta* and *paakam*, improving inflammation and inducing healing.

Jalookaavacaaraṇa was done every alternate days. Indicated in *avagaadha* and *grathita* conditions<sup>[23]</sup>, *Grathita* is explained as *grantheebhootam*<sup>[24]</sup> by Hemadri and Arunadatta clarifies further as conditions of *granthi-arbudam*<sup>[25]</sup>. Thus, it can be taken as an ideal treatment in conditions associated with *siraajagranthi*, which is the main cause for formation of *dushtavrana*.

### Stage 2 - *Vraṇa śodhana and ropāna*

#### Internally

Thikthakam Kwatham<sup>[26]</sup> mentioned in *dushta naadi vraṇa*, *bhagandara* and other *pitta* conditions, indicated for channel clearing as well as healing of wounds.

Guggulupanchapala Chooranam<sup>[17]</sup> was given with honey for potentiating action of honey<sup>[27]</sup> and also is *lekhana*, *śodhana* and *ropāna* of *vraṇa*.

Externally

Application of *Śodhita Tankana*<sup>[28]</sup> over swollen limb to reduce oedema aiding reduction of pressure to venous circulation and thereby ease circulation and promote arterial blood supply as well as faster healing. This, along with Jathyadi Ghritham<sup>[29]</sup> over wound helps in *vraṇa śodhana* and *ropāna* with action of *tuttha* helping removal of unhealthy tissues.

*Jalookaavacaaraṇa* was advised once in 4 days. Its details were mentioned previously. Studies done elaborately on hirudin in leech saliva show



several mechanisms of action. First hirudin temporarily increases blood flow by helping discharge of venous pooling, providing more time for angiogenesis to occur. Second, hirudin promotes absorption of blood and exudate by alleviating arterial wall spasm, dilating blood vessels and accordingly circulation.

Thirdly, hirudin has high affinity for thrombin and can form a 1:1 complex with it through irreversible covalent bonds. The anticoagulant, antithrombotic and antiplatelet aggregation effects of hirudin help in vascular endothelial growth factor (VEGF) to promote micro vessel growth<sup>[30]</sup>. Finally, hirudin plays an anti-inflammatory role, reducing free radicals and inflammatory factors in damaged tissues contributing to VEGF expression and angiogenesis<sup>[31]</sup>.

### Stage 3- *Rasaayanam*

#### Internally

Mahatikthakam Ghritam<sup>[32]</sup> especially mentioned for its *rasaayana* property along with *vranā sodhana* and *ropāna* properties, thereby prevent recurrence of another *vranā*.

#### Externally

Shatadhouta Ghritam<sup>[33]</sup> with Yashada Bhasmam<sup>[34]</sup> together provides adequate moisture to the skin and thus prevent dry lesions which could precipitate another episode.

### Conclusion

Individualising the *nidaana* for formation of *dushtavranā* has better results than a mere *sodhana-ropāna* approach especially in varicose related ulcers. Further, instead of specifying drugs for such a condition, the *rogi* and *roga avastha* can be imbibed into this protocol of initial *srotasodhana- vranā sodhana-ropāna* and finally *rasaayana* so as to achieve a complete reduction in the symptoms. This being a small sample study, further studies need to be done in larger samples.

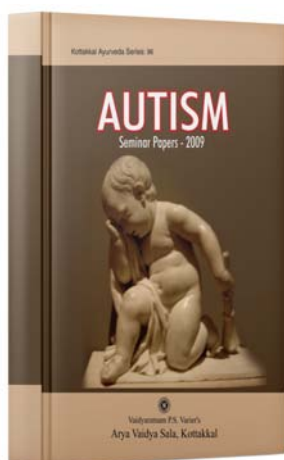
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### Autism

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Pervasive Developmental Disorders (PDD) or Autism Spectrum Disorders (ASD) are heterogeneous group of neuro-developmental disorders characterised by impairment in reciprocal social interaction, communication and behaviour with restricted repertoire of stereotype interest and activities. Autism occurs in all racial, ethnic and social group, and there have been an increase in the number of children receiving a diagnosis of autism. Education becomes a formidable task and adult cases of autism mainly remain refrained within the walls of their houses, even though many may be able to take care of the activities of daily living. Autistics, however show, several savant skills and an excellent route memory.



# Ayurveda intervention in behavioural disorder of children

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**ABSTRACT:** Behavioral problems are commonly prevalent worldwide. These disorders include many tension reducing activities that appear during childhood at various levels of development. All young children can be naughty, defiant and impulsive from time to time, which is perfectly normal. However, some children have extremely difficult and challenging behavior that are outside the norm for their age. This review is based on data collected from classical ayurvedic literature, published research works in various journals and counseling experiences. These problems can result from temporary stressors in the child's life, or they might represent more enduring disorders. It is important to diagnose and treat them timely, as they increase the risk of getting psychiatric illnesses, if left untreated. Treatment options include psycho education of parents, cognitive behaviour therapy, adoption of *ayurveda* principles and medication and treatment for associated problems. *Ayurveda* is the science that encompasses the mind, body and soul with the health. *Ayurveda* principles such as *aacaara- rasaayana*, *sadvritta* and *satvaavajaya- cikitsa*, *swarnpraasana*, *antaparimaarjana*, *bahiparimaarjana* are the best non pharmacological and pharmacological modalities required for the prevention of behavioural problems. It is common knowledge that *ayurveda* is used to treat physical ailments, it is very much beneficial in treating psychiatric issues as well.

**Key words:** Behavioural disorder of children, *Satvaavajaya*, *Swarnpraasana*, *ayurveda* in behaviour disorder.

## Introduction

Mental health of a child is of basic importance to gain the ability to live harmoniously in the changing environment. Child's health is the corner stone of national progress. The community which neglects its children retards their future progress. UNICEF has given great attention to the concept of development of the whole child which means it is essential to promote their health as they are the vulnerable segment of the society<sup>[1]</sup>. In India, children below 16 years of age constitute over 40% of its population<sup>[2]</sup>. Community studies on emotional/behavioural disorders in children and adolescents conducted in India have yielded desperate point prevalence estimates (2.6% to 35.6%)<sup>[3,4,5]</sup>. Behavioral problems of children are becoming common and roughly 6 million children

globally<sup>[6]</sup> and out of these 33.4% in India are affected by different behavioral problems<sup>[7]</sup>. Methodologically robust studies on community sample share reported overall point prevalence rates of behavioural disorder is 9.4% in children aged 8-12 years, 12.5% in children aged 0-16years<sup>[5]</sup>. In India, the prevalence rate of behavioural disorders is such as 43.1% and 14.5% conduct disorder, 29.7% attention-deficit/hyperactivity disorder, 12.5% emotional disorder, 7.1% scholastic disorders, 2% adjustment disorder and 9.5% pervasive developmental disorder<sup>[8]</sup>.

If we take a close look at the families of today's society, we will be aware of the horrible fact that even children are being affected by behavioural and mental disorders of various types. When children cannot adjust to a complex environment

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around them, they become unable to behave in the socially acceptable way, resulting in exhibition of peculiar behaviour. Diagnostic and Statistical Manual of Mental Disorders (DSM) lists categories of disorders along with a number of different related disorders. Example categories in the DSM-5 include anxiety disorders, bipolar and related disorders, depressive disorders, feeding and eating disorders, obsessive-compulsive disorders and personality disorders<sup>[9]</sup>.

The U.S. Department of Health and Human Services Trusted Source describes behavioural disorders as involving “a pattern of disruptive behaviour in children that last for at least 6 months and cause problems in school, at home, and in social situations”<sup>[10]</sup>. Nearly, everyone shows some of these behaviour at times, but behaviour disorders are more serious.

Behavioural disorder results due to emotional, physical and social deprivation. These disorders may be a result of various factors such as the disharmonious parent-child relationship, family or marital problems, child abuse or neglect, chronic illness, injury, separation or bereavement. Problems in children are often multifactorial and their manner of expression too varies in relation to various stresses they go through. In stressful situations, young children usually do not express their behaviour or reactions to different events at once; they build up often to be expressed later. They usually tend to react with disturbed physiological functions such as eating and sleeping. Older children may exhibit disturbances in relationships with friends and family, poor school performance or development of various fears and phobias, these can pose a difficulty for the parents to judge whether this behaviour is normal or aberrant enough to require help.

Behavioural problems in children are actually the characteristics that do not meet the criteria of mental disorder, but can lead to the development of mental disorder in later life, if not taken care of. Behavioural problems can be of different types-

both externalizing and internalizing i.e. hyperactivity, inattention, temper, tantrum, depression, anxiety, aggression, disobedience, peer problems, nail biting, thumb sucking, sleep problems etc. Behavioural problems in children should be identified and managed as early as possible to prevent further complications.

### **Stages of psychological development:<sup>[11]</sup>**

According to Erik Erikson, a person passes through eight developmental stages that built on each other. At each stage we face a crisis. By resolving the crisis, we develop psychological strengths or character traits that help us become confident and healthy people.

#### **Hope : trust vs mistrust (oral –sensory, infancy, 0-1 years)**

The first stage of Erikson is theory of psychosocial development occurs between birth and 1 year of age and is the most fundamental stage in life. Because an infant is utterly dependent, developing trust is based on the dependability and quality of the child as caregivers. At this point in development, the child is utterly dependent upon adult caregivers for everything they need to survive including food, love, warmth, safety and nurturing. If a caregiver fails to provide adequate care and love, the child will come to feel that they cannot trust or depend upon the adults in their life.

#### **Outcomes**

If a child successfully develops trust, the child will feel safe and secure in the world. Caregivers who are inconsistent, emotionally unavailable, or rejecting contribute to feelings of mistrust in the children under their care. Failure to develop trust will result in fear and a belief that the world is inconsistent and unpredictable.

#### **Will: autonomy vs shame and doubt (early childhood, 1-3 years)**

The second stage of Erikson’s theory of psychosocial development takes place during early childhood and is focused on children developing a

greater sense of personal control. At this point in development, children are just starting to gain a little independence. They are starting to perform basic actions on their own and making simple decisions about what they prefer. By allowing kids to make choices and gain control, parents and caregivers can help children develop a sense of autonomy. The essential theme of this stage is that children need to develop a sense of personal control over physical skills and a sense of independence.

#### **Outcomes**

Children who struggle and who are shamed for their accidents may be left without a sense of personal control. Success during this stage of psychosocial development leads to feelings of autonomy; failure results in feelings of shame and doubt.

#### **Purpose: initiative vs guilt (locomotor-genital, preschool, 3-5 years )**

The third stage of psychosocial development takes place during the preschool years. At this point of psychosocial development, children begin to assert their power and control over the world through directing play and other social interactions.

Children who are successful at this stage feel capable and able to lead others. Those who fail to acquire these skills are left with a sense of guilt, self-doubt and lack of initiative.

#### **Outcomes**

The major theme of the third stage of psychosocial development is that children need to begin asserting control and power over the environment. Success in this stage leads to a sense of purpose. Children who try to exert too much power experience disapproval, resulting in a sense of guilt.

#### **Competence : industry vs inferiority (latency, school age 6-11 years)**

The fourth psychosocial stage takes place during the early school years from approximately ages 6 to 11. Through social interactions, children begin to develop a sense of pride in their accomplishments and abilities.

Children need to cope with new social and academic demands. Success leads to a sense of competence, while failure results in feelings of inferiority.

#### **Outcomes**

Children who are encouraged and commended by parents and teachers develop a feeling of competence and belief in their skills. Those who receive little or no encouragement from parents, teachers or peers will doubt their abilities to be successful.

#### **Fidelity : identity vs role confusion (11 - through the end of adolescence)**

The fifth psychosocial stage takes place during the often turbulent teenage years. This stage plays an essential role in developing a sense of personal identity which will continue to influence behaviour and development for the rest of a person's life. Teens need to develop a sense of self and personal identity. Success leads to an ability to stay true to yourself, while failure leads to role confusion and a weak sense of self.

During adolescence, children explore their independence and develop a sense of self. Those who receive proper encouragement and reinforcement through personal exploration will emerge from this stage with a strong sense of self and feelings of independence and control. Those who remain unsure of their beliefs and desires will feel insecure and confused about themselves and the future.

Erikson believed that his theory was a "tool to think with rather than a factual analysis." So take these five stages( the rest three stages are starting from adulthood) as the starting point you use to help your child to develop the psychosocial skills they need to become a successful person, but do not take them as a law.

Erikson also believed that a sense of competence motivates behaviours and actions. Each stage in Erikson's theory is concerned with becoming competent in an area of life.



If the stage is handled well, the person will feel a sense of mastery, which is sometimes referred to as ego strength or ego quality. If the stage is managed poorly, the person will emerge with a sense of inadequacy in that aspect of development.

### Signs of mental health problems in children<sup>[12]</sup>

#### Emotional and behaviour signs

- Does not seem to enjoy things the way they used to.
- Has repeated tantrums or consistently behaves in a defiant or aggressive way.
- Seems sad or unhappy, or cries a lot.
- Is afraid or worried a lot.
- Gets very upset about being separated, avoid or avoids social situations.
- Starts behaving in ways that they've outgrown, like sucking their thumb or wetting the bed.
- Has trouble paying attention, can not sit still or is restless.

#### Physical signs

- Is not sleeping well or oversleeps.
- Has difficulty getting out of bed.
- Has trouble eating or overeats.
- Has lost or gained a lot of weight.
- Has physical pain that does not have a clear medical cause – for example, headaches, stomach aches, nausea or other physical pains.

#### Social signs

- Is not doing as well as usual at school
- Is having problems fitting in at school or getting along with other children
- Does not want to go to school
- Is not doing what their teacher asks
- Has withdrawn from their friends
- Does not want to go to social events like birthday parties or usual activities like sports.

#### Mind in ayurveda

*Mana* is the entity through which the knowledge is obtained, which is closely related with *Aatmaa*,

through which one can perceive and the seat of *mana* is *hrdaya*<sup>[13]</sup>.

*Manas* is told as '*ubhayaatmaka*' i.e. it is a dual faculty which has both sensory and motor functions and hence considered as a superior faculty because it controls and co-ordinates all other faculties connecting them with the soul<sup>[14]</sup>.

In contemporary psychology, mind is an all-encompassing umbrella term that covers the joint functioning of the brain and body in conjunction with the memory, world view, personality, soul, and other intangible facets of human life and psychology. It covers the way a person interacts with people and the world, how they learn and express themselves and how they relate to abstract concepts such as religion, spirituality, metaphysics and other areas of thought. The mind is the manifestations of thought, perception, emotion, determination, memory, knowledge, conscience and imagination that take place within the brain<sup>[15]</sup>.

In *ayurveda*, child behavioural disorders are known to be a *vaata* imbalance. The word *vaata* is defined as "*vaa gatigandhanayoh*"<sup>[16]</sup>. "*Vaa*" word is concerned with movement (*gati*) and intimation (*gandhana*). The meanings of word '*gati*' are motion, moving and going. The meaning of word *gandhana* are intimation, information and perception. The principal functions of *vaata dosha* are maintaining and controlling all the human machinery or body (*tantra yantradhara*), causing all kinds of movements (*parvarttaka ceshtaanam uccaavacaanaam*), *Vaata* regulates and guides the mind (*niyantaa pranetaa ca manasa*), stimulates all sensory and motor organs (*sarvendriyaanam udvejakah*), directs senses to their respective objects (*sarvendriyaarthanam abhivodhaa*). It is responsible for proper building of the tissues and organs of the body (*sarvasareera dhaatu vyuhakara*), Also *vaata* connects the different tissues (*sandhaanakara sareerasya*), Induces speech

(*pravartako vaaca*) etc<sup>[17]</sup>. Things experienced by the sense organs should be distinguished between helpful or negative, good or evil, and this is achievable by the smooth functioning of the mind.

Thus, imbalance in its amount, causes mental instability, irrelevant talks and overall distorts the children's mental ability to maintain a balance between talks. With weak *vaata*, a child is not able to move hands, see or hear properly, even the initiation or coordination is also affected. Sense organs for hearings are first initiated so that they can respond to a particular stimulus. *Vaata* is required to carry the sound to the hearing apparatus to recognize it's actual meaning. If somehow the *vaata* part is defective, nothing can be properly heard or recognized.

Although *vaatadosha* is prominent but later on, higher levels of imbalance of it impairs the *pitta dosha*, which leads to eagerness, frenzy, fury or jumping behavior in children. High energy levels, zestful responses of the brain and nervous system and behaviour issues happen due to the high level of *pitta dosha* in children. That may be the reason behind the child's hyperactive behaviour.

Ayurvedic treatment involves a combination of behavioral therapy and medications. *Ayurveda* says that both medication and behavioral modifications are necessary to cure behavioral disorders. The treatment helps in improving the self-control and other behavioral aspects. They also suggest using the various medications to calm the senses and help in improving the behavior.

The principle involved in treating behavioural disorder-

### **Deepana and Paacana**

This theory corrects the digestive fire and *aama*. In this way, it corrects the appetite, removes the *srotas*- obstructions by eliminating the *aama* and helps to properly feed all seven tissues.

### **Srotassodhana (cleansing the channels)**

Primarily the channels that perform brain functions are affected. *Doshas* get vitiated in the person possessing low level of *sattva guna* (weak minded people) in turn vitiate *hrdaya* (mind), which is the seat of intellect. There from the channels carrying mental factors (*mano-vaha srotasas*), quickly delude the mind of the person<sup>[18]</sup>. Ayurvedic herbs are helping to remove obstruction in channels, particularly *manovaha-srotas*. Because of its penetrating and digestive properties, it clears the channels by digesting the *aama* and helps the brain to function normally.

**Rasaayana medicine** – *Rasaayana* is the therapy which is mostly used for promotion of strength Including immunity and alleviation of disorders<sup>[19]</sup>. The *dravyas* which promote the body tissues (*dhaatus*) are known as *rasaayana*<sup>[20]</sup>. *Rasaayana* is used for both purpose to promote strength in the healthy and as well as to cure the disease. From promotive treatment, one attains longevity, memory, intelligence, freedom from disorders, youthful age, excellence of lustre, complexion and voice, optimum strength of physique and sense organs, successful words, respectability and brilliance. *Rasaayana* (promotive treatment) means the way for attaining excellent *rasa* like *dhaatus*<sup>[21]</sup>. *Medhya rasaayana* drugs are those which particularly work on mental development and rejuvenate nervous system. The use of the juice of *mandukaparni*, the powder of *yastimadhu* with milk, the juice of *gudooici* (stem) and the paste of *sankhapushpi* along with root and flowers -these *rasaayana* drugs are life promoting, disease alleviating and the promoters of strength, *agni*, complexion, voice and intellect. Out of these, *sankhapushpi* is specifically intellect promoting<sup>[22]</sup>.

### **Pancakarma therapies**

There is important role of *pancakarma* if *doshas* are more vitiated. *Pancakarma* therapies eliminate

*aamal/toxins. Pancakarma* -pre procedures, major procedures with ayurvedic medication have good impact on conduct disorders by maintaining *dhṛti* and preventing ethics negligence. *Dosha* - imbalance can be taken care with the help of *pancakarma* to detoxify toxins, facilitate adequate nutrition to *dhatu*s and balance equilibrium in brain. Stress plays a vital role for inequilibrium of *dhee*, *dhṛti* and *smṛti*. *Pancakarma*, *praanaayaama* (breathing techniques), *yogasana*s (postures), *bandha-mudras* (postural relaxation and meditation ways) and *medhya* medicines relieve stress and maintain

the proper function of neurotransmitters and inturn central nervous system.

Different *pancakarma* pre-procedures with their mode of action helping to cure and prevent behavioral problems in children.

*Satvaavajaya cikitsaa*- *Satvavajaya cikitsa* is an unique non-pharmacological approach for treating the mental disorders. It is the first of its kind and if developed can really prove much useful. Lord Krishna was the first counselor who delivered the message of *Gita* to Arjuna in the battle field of Mahabharata when the latter got

Table 1		
No.	Procedure	Mode of action
1	<i>Sirodhaara</i> - pouring of herbal oil, medicated milk or decoction over forehead	Vasodilatation, tranquilizing effect due to increase in brain circulation, cognition, improved memory, sleep, Relieves irritability <sup>[23,24]</sup>
2	<i>Sirolepa</i> - application of a paste of herbal formulations across the entire scalp	Calm and cooling effect, mood regulation <sup>[25,26]</sup> .
3	<i>Nasya</i> -medicated oil instillation	Stimulant action on brain and its sensory-motor centres. Relievedsymptoms of ADHD, Autism <sup>[23,27]</sup> .
4	<i>Snehana</i> - application of oils and ghritas to the entire body <i>Swedana</i> - inducing sweat in the patient	Nourishment to skin, muscles, nerve endings, <i>vaata</i> pacifying action by increased circulation and vasodilatation leads to improve motor function,bulk and strength. Relieves pain, stiffness <sup>[26,28]</sup> .

depressed. This is a beautiful example of counseling, a sort of psychotherapy<sup>[29]</sup>.

*Satvaavajaya* helps to attain a stable and harmonious equilibrium between man and his environment needed to reduce man's vulnerability to mental diseases and to permit him to lead a more productive and satisfying life. Thus controlling or restraining the mind from desire for unwholesome objects is nothing but *satvaavajaya*, which can be achieved by increasing *satva* to subdue the vitiated *maanasa dosha* i.e. *rajas* and *tamas*.

The other psycho-supportive techniques like assurance, consoling the children by proper guidance and suggestion, quoting well known references and mythological stories with good moral, replacing the emotions, entertaining the patient with recreational therapy come within the limits of definition of *satvaavajaya*.

### *Aacaara rasaayana*

Acharya Charaka has laid down the unique concept of *aacaara rasaayana* which provides good mental, physical, social and spiritual health to the person who regularly follows it <sup>[30]</sup>. It is the rejuvenating behavioral therapy for the body and mind. It involves around psychological connection with physical health. *Aacaara-rasaayana* involves implementing positive lifestyle like having *satvik* diet, speaking the truth, practising non-violence, avoiding anger, indulging in spiritual and religious activities. *Rasaayana* therapy acts by correcting the *doshas* imbalance, improves *agni* and leads to qualitative production of *dhaatu* and increase the quality and quantity of, which is the factor concerned with immunity and health. Practising *Aacaararaasayana* helps reducing stress. It is also proved that religious involvement



and spiritual well-being has a positive impact of physical, mental health and longer survival.

Thus, *aacaara rasaayana* encourages a moral path of integrity which directly relates to individual's state of health.

**Samskaara**—Any process which brings continuous positive change in a given *dravya*, *sareera*, *mana* and the *aatma* is called *sanskara*<sup>[31]</sup>. Sixteen *samskaras* are described in *samhita*. *Samnskaaras* are those religious rites and ceremonies which sanctify the body, mind and intellect. Physician can assess the proper growth and development of the child while performing the *samskaara*. It is a thought and a related action when repeated a number of times creates an impression of that thought and action on our mind. It is helpful to announce attainment of different milestone thus ensure proper physical and mental growth and to differentiate them from the child with any illness.

**Swarnaprasana** - Pure gold (in small quantity) is rubbed in water on a clean stone with honey and *ghrta*, be given to child for licking of gold increase intellect, digestive power and metabolic power, strength, gives long life, is auspicious, virtuous, increase complexion and elimination the *graha* (evil effect)<sup>[32]</sup>. It enhances the normal synaptic communication in brain<sup>[33]</sup>, diminishes the impact of depression as well as enhances the ability to focus<sup>[34]</sup>.

**Discussion**—Fulfilling only the material needs of a child and giving him/her a comfortable and luxurious life is just one part of the best child care program. On the other hand, the pre requisite component of emotional care and close bonding looks conspicuously missing in many cases. Most of the parents often unintentionally commit the crime of neglecting to cater various needs of their children. Spending time with little one and engaging in conversations with child is more important than buying digital toys.

## Conclusion

When mental health issues are diagnosed, it should be treated early, they often have excellent long term outcomes. When left undiagnosed and untreated, children and their families suffer needlessly. According to *ayurveda*, body and mind have symbiotic association therefore, diseases of body and mind affect vice versa to each other<sup>[35]</sup>. In *ayurveda* neither this disease nor the symptoms of behavior disorder are described but some references about abnormal behavior are discussed under features of *vaataprakrti*, *anavasthita cittatva*, *mano vibhrama*, *buddhi vibhrama*, *smrti vibhrama*, *seela vibhrama*, *ceshta vibhrama* and *aacara vibhrama*.

*Ayurveda* believes health to be a balance of mental, physical, and spiritual wellness. Our physical and mental health is intertwined, and we must look at ourselves in this holistic light. *Ayurveda* can act as an excellent adjuvant in advanced stage or alone capable to deal with behaviuor disorder with the help of *satvaavajaya*, *aacararassayana*, *sadvrta* and nootropic medicines with *pancakarma* and its pre-procedures. It is imperative to direct them through elders to prevent behavioral and conduct problems with adoption of *ayurveda*.

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## Effect of Srngyaadi Leha and it's syrup in the management of kaphaja kaasa in children

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**ABSTRACT:** *Kaphaja kaasa* is one of the *kaasaroga* which can be co-related with URTI in modern science. *Aacarya* Chakrapani has depicted “*Srngyaadi Leha*” for treating *kaasa* in children. *Leha kalpana* possesses certain inconveniences while administration, handling, packaging and transportation. This urged the need of conversion of *Srngyaadi Leha* into its new dosage form. The perception of the present study is to find out the clinical effect of *Srngyaadi Leha* and syrup in *kaphaja kaasa*. This disease is now a worldwide health hazard. Though lot of work has been carried out in medical science number of *kaasa* in children's cases are reporting in day-to-day practice and it has become a challenge for the researchers. Some studies have been done in the management of *kaphaja kaasa* with *Srngyaadi Leha*, but there are no studies on different dosage forms. So, the present study was carried out to compare the results of *Srngyaadi Leha* and its new dosage form *Srngyaadi syrup*.

In *kaasa kaphadosha*, *vaatadosha*, *rasa dhaatu* and *anna dhaatu* are vitiated. *Srngyaadi Leha* and its syrup have *kapha-hara* properties. So, these drugs are used for the clinical study to compare their efficacy in the management of *kaphaja kaasa*. In this study all the patients were selected according to the inclusion criteria and by single blind randomized method. Design of the study was two arm comparative trials. Thirty patients were randomly divided into two groups A and B and treated for 10 days. Group A was treated with *Srngyaadi Leha* and Group B was treated with *Srngyaadi syrup*. After complete course of treatment, the data collected was statistically analysed and tabulated. In this study Group A has shown better and significant ( $P < 0.001$ ) results than Group B. Group A showed highly effective result in reducing symptoms like character of bouts, character of cough, frequency of bouts/day, *ghana kapha*.

**Keywords :** *Kaphaja kaasa*, *Srngyaadi Leha*, Cough

### Introduction

Management of childhood illness is significantly at variance with that of an adult. *Srngyaadi Leha*, is one such emphatic substructure mentioned by *Aacaarya* Chakrapani in his treatise *Cakradutta* in *Balarogadhikaara* for the administration in *kaasa* in children<sup>[1]</sup>The constituents of the *Leha* viz., *Karkatasrugi*, *Ativisha* and *Musta* with honey. In the coeval study, this drug is tabbed for the treatment of *kaphaja kaasa* and is indoctrinated into new dosage forms, that is, syrup,

to see the contrastive effects. *Kaasa* has occupied the dual place as a cause and as a symptom/complication and a separate entity as a disease, with distinct aetiopathogenesis, described by Caraka in *cikitsaa sthana*<sup>[2]</sup>, *Susruta nidaansthana*<sup>[3]</sup> *Ashtanga sangraha*<sup>[4]</sup>, *Ashtanga hrdaya*<sup>[5]</sup>and distinctly explained in *Maadhava nidaana*<sup>[6]</sup>. *Kapha dosha* is dominant in childhood which is one of the causes in producing *kaasa*. At the OPD level, it has been observed that the incidence of respiratory infection presenting with

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cough is more. Early treatment is very necessary in the case of *kaasa* as it is a potential *nidaanartha kara vyaadhi* (causative factor for another disease) to produce *kshaya* (emaciation)<sup>[7]</sup>. It is important to treat *kaasa* in childhood at the earliest as it may hamper the proper *vrddhi* (growth and development) of a child<sup>[8]</sup>.

Cough is one of the most common difficulties referred to by paediatricians. Cough in children causes significant anxiety to parents, and the use of inappropriate or unnecessary medications for a cough is associated with adverse measures<sup>[9]</sup>. Childhood acute respiratory infection (ARI) is a significant public health problem, especially in developing countries<sup>[10]</sup>.

W.H.O estimates, ARI causes 3.9 million deaths throughout the world every year<sup>[11]</sup>. Upper respiratory tract contamination with cough in school children occurs 7–10 times per year<sup>[12]</sup>. *Srngyaadi Leha* - A polyherbal ayurvedic compound, is useful in treating respiratory disorders and promoting health. The use of these medications not only treats the disease but also provides nutrition and develop natural immunity of the body. So, the objective of this research work is to provide a unique, accurate & effective method of dealing with the complexities of this disease. Under this study, the formulation of a new drug dosage from *Srngyaadi Leha* led to a marginal increase in the cost, but the researcher has been able to achieve more palatable and economic results.

## Material & methods

### Preparation of test drugs

*Srngyaadi Leha* was prepared by different the textual references. First, *coornikarana* process was done by according to *Sharngadhara Samhita*<sup>[13]</sup>. [ma kh 6/1] After that *Leha* was prepared according to the classical text *Chakradutta*<sup>[14]</sup>. In the preparations of *Srngyaadi* syrup, *kwatha* was prepared according to *Sharngadhara Samhita*<sup>[15]</sup>. [ma kh 6/1]. And final product syrup was prepared conferring to Indian

pharmacopeia<sup>16</sup>, 66.7% of sugar was added in syrup<sup>[16]</sup>.

### Selection of patients

Out patients and In patients of Department of Rasa Shastra & Bhaishajya Kalpana and Department of Bal Rog, UAU, Rishikul campus Hospital Haridwar, fulfilling the criteria of diagnosis of *Kaphaja kaasa*, were selected, and registered with out considering age, sex, and religion.

### Criteria for diagnosis

Patients having signs and symptoms of *kaphaja kaasa*, as described in the ayurvedic classics, namely, *ghana kapha*, *chardi*, *peenasa*, *kaasa*, character of cough, character of bouts, colour of sputum and frequency of bouts, were selected in all the studies. Detailed history was taken and physical examination was done based on a special proforma prepared by scholar, incorporating all signs and symptoms of the disease.

### Investigations

Routine haematological, especially white blood cell (WBC) count, erythrocyte sedimentation rate (ESR) and absolute eosinophil count (AEC) were carried out in all the patients to assess the condition of disease and to exclude any other pathology.

### Diet and restriction

Patients were advised to avoid the aggravating factors mentioned in standard literature of *ayurveda*.

### Posology

In Group A *Srngyaadi Leha* was given at a dose of 5.5-16.5g/day and in group B *Srngyaadi* syrup was administered at a dose of 5- 15 ml/ day. All the drugs were given for 10 days in two divided doses.

### Criteria for the assessment

Effects of the clinical trial drugs were analysed in terms of relief produced in basic signs and symptoms before and after treatment. Before and after treatment, the effects of trial medications were examined on specific parameters such as WBC count, AEC, and ESR. Changes observed



in signs and symptoms were assessed by adopting suitable scoring method.

## Results

### On subjective parameters

Present clinical trial showed the following results. Effect on character of cough statistically highly significant ( $p < 0.001$ ) result was obtained in group A. Group A relief was 85.18%, and in group B, relief was 70.83%. Thus, the better result we obtained in group A than group B ( $p < 0.001$ ). Administration of medication in group A 86.95%, lessening in the character of bouts, which was statistically highly significant at  $P < 0.001$  and in group B, 66.66% was lessened, which was statistically significant at  $P < 0.001$ . After ten days of provided treatment, 87.5% effects in the frequency of bouts in group A, which was statistically highly significant at  $P < 0.001$  and 68.18% effect in group B, which was statistically significant at  $P < 0.001$ . Effect on *ghana kapha* in Group A, 86.95 % and in group B, 75% relief

was obtained, which was statistically significant ( $p < 0.001$ ) in *ghana kapha*. After Administration of drug 87.50% amenities in group A which was statistically highly significant at  $P < 0.001$ , and 71.42% amenities in group B, which was statistically significant effect on the colour of sputum at  $P < 0.001$ . 40% Effect was found in group A and 66.66% relief in group B on chest pain. When these values were analysed statistically, the p-value showed significant value ( $< 0.050$ ) and highly significant value ( $< 0.001$ ) for group A and group B, respectively. Statistically highly significant ( $p < 0.001$ ) result was obtained in group A. Statistically significant ( $p < 0.05$ ) result was obtained in group B. Group I relief was 77.77%, and in group B, relief was 63.63%. Thus, the mild better result was obtained in *peenasa* in group B. Relief on *chardi* in Group A was 50 %, and in the group, B relief was 33.33% thus the mild better result was obtained in *chardi* group A. [Table 1]

Table No. 1  
inter-group comparison of subjective parameter

S.No	Subjective Parameter	Group	N	Mean Rank	Sum of Rank	U-test	P-Value	Result
1.	Character of cough	Group A	15	1.53	277.5	67.5	<0.05	Sig
		Group B	15	1.13	187.5			
		Total	30					
2.	Character of bouts	Group A	15	1.33	275	70	<0.05	Sig
		Group B	15	0.93	190			
		Total	30					
3.	Frequency of bouts/day	Group A	15	1.4	271.5	73.5	<0.05	Sig
		Group B	15	1	193.5			
		Total	30					
4.	<i>Ghana kapha</i>	Group A	15	1.33	250.5	79.500	<0.05	Sig
		Group B	15	1.07	184.5			
		Total	30					
5.	Colour of sputum	Group A	15	1.4	271.5	73.5	<0.05	Sig
		Group B	15	1	193.5			
		Total	30					
6.	Chest pain	Group A	13	0.66	12.5	6.500	<0.001	Sig
		Group B	15	0.8	23.5			
		Total	30					
7.	<i>Peenasa</i>	Group A	13	0.87	90.5	33.5	<0.001	Sig
		Group B	15	0.63	99.5			
		Total	30					
8.	<i>Chardi</i>	Group A	13	0.5	5	2	<0.001	Sig
		Group B	15	0.5	5			
		Total	30					

Table No: 2  
Intergroup comparisons of objective parameters

S.NO	Objective Parameters	Group	No of Pt	Mean	SD	SE	t-Value	P-Value	Result
1.	TLC	Group A	15	353.333	364.234	94.045	1.036	0.309	Significant
		Group B	15	226.667	302.90	78.21			
		Total	30						
2.	Nutro	Group A	15	1.000	3.443	0.889	0.923	0.364	Significant
		Group B	15	-0.2333	3.863	0.997			
		Total	30						
3.	Lympho	Group A	15	0.267	3.348	0.864	-1.448	0.159	Significant
		Group B	15	2.593	5.245	1.354			
		Total	30						
4.	Eosino	Group A	15	1.600	0.736	0.190	0.707	0.485	Significant
		Group B	15	1.307	1.428	0.369			
		Total	30						
5.	Mono	Group A	15	0.147	0.280	0.0723	0.131	0.897	Significant
		Group B	15	0.133	0.279	0.072			
		Total	30						
6.	Baso	Group A	15	0.0333	0.377	0.097	-0.299	0.767	Significant
		Group B	15	0.0667	0.209	0.054			
		Total	30						
7.	AEC	Group A	15	32.200	19.135	4.940	1.211	0.118	Significant
		Group B	15	24.667	14.646	3.782			
		Total	30						
8.	ESR	Group A	15	0.733	0.883	0.228	0.676	0.505	Significant
		Group B	15	0.467	1.245	0.322			
		Total	30						

### Results on objective parameter

Haematological parameters like TLC, AEC, Eosinophil count, Neutrophils, ESR play an important role in cough. The increase in eosinophils suggests increasing activation of allergic response. Lymphocytes counts in peripheral blood were not related to any respiratory symptom or diagnosis. There was no evidence of a relation between neutrophil counts and either atopy or airway responsiveness. In both groups, ESR and AEC were statistically highly significant ( $p < 0.001$ ). In the group, A & B other parameters are statistically significant. [Table 2]

### The overall effect of therapy

In group A, 66.66% of patients observed complete remission, while 6.66% of patients got excelled improvement, 20% got marked improvement, and 6.66% got moderate improvement in this group. In group B, 40% of patients attained complete improvement, 20% got excelled improvement, 26.66% got marked improvement, 6.66% patients

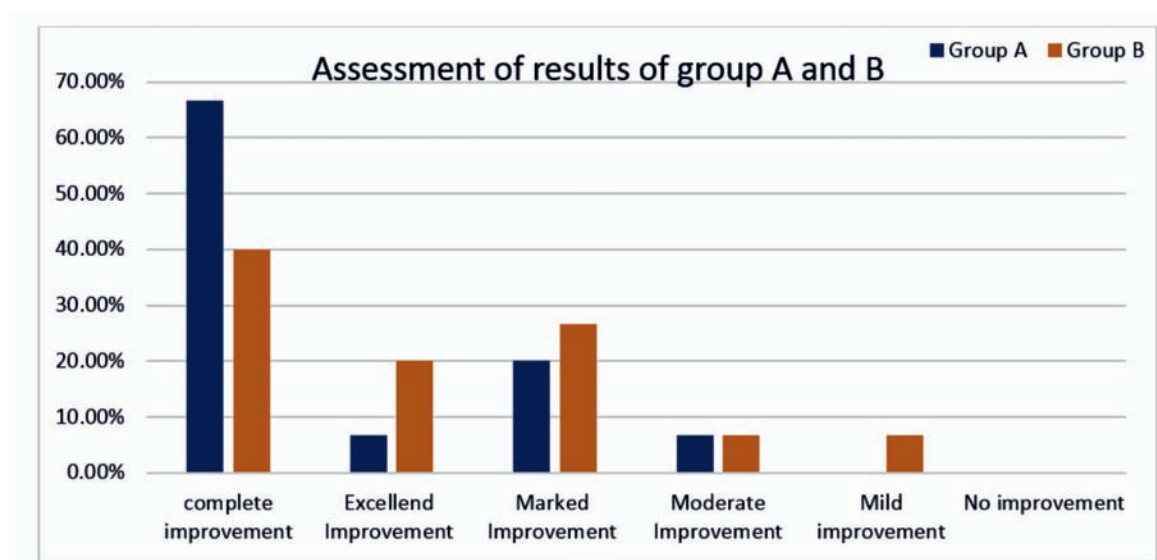
got moderate improvement, and 6.66% patients attained mild Improvement.

### Discussion

*Kaasa* is hazardous disease in which *kapha* and *vaata* are excessively increased with *rasa* and *annavaha-sroto dusti*<sup>[17]</sup>. Hence, the treatment should control *kapha* and take care of vitiated *vaata*. So, in this study of Srngyaadi Leha and Srngyaadi Syrup were used which acted on the *sampraapti-vighatana* (etiopathogenesis) of *kaphaja kaasa*. In group A (Srngyaadi Leha) it had the highest proportion of all active biological ingredients as a drug is consumed in *Leha*, without any changes to modify the way of intake, hence it has got maximum results. Group B (Srngyaadi Syrup) it was found less effective, may be because some active constituents were destroyed due to the administration of heat in preparation. It gave relief in symptoms of chest pain; character of cough and *ghana kapha* was found effective in new cases with a recent origin of disease.

Figure 1

Based on relief overall effect of Group, A > Group B respectively which can be justified as:



The results of this study show that '*Leha*' provides a more efficacious treatment of this disease as compared to syrup. It could be because of the retention of all the bioactive components of the drug, specifically the non-polar ones, which is not possible in syrup form however, the consumption of *Leha* as a whole help in overcoming these drawbacks.

#### Probable mode of action

*Karkatasrangi*, *Ativisha* and *Musta* are well reported for their antimicrobial<sup>[18], [19]</sup> activity, whereas honey is a bio availability enhancer. All the contents of Srngyaadi Choorna have *ushna*, *kapha-vaataghna* and *kaasa-hara* properties for the management of *kaasa* and other inflammatory conditions of the respiratory system. This helps internally by increasing the elasticity of lung tissue. Also, *kaphaghna* and *kapha-nissaaraka guna* will help in clearing blocked channels, i.e., *srotorodha* and *vaataanulomana* will be achieved so that the *kupita vaata* will attain its *samyak* state and there will be relief in the symptoms of *kaasa*. These all ingredients are *katu*, *tikta* and *kashaya rasa-pradhaana*, acting over *kapha-dosha* and thereby restoring the normal function of *aamaasaya*, which is the

*adhisthana* of this *vyaadhi*, thus decreasing the episodic recurrence of the illness and providing long term relief to the patient. All these characteristics made these drugs act on *praana*, *udaka* and *anna vaha srotas* so, *sampraapti vighatana* occurs in a systemic manner starting from the *aamaasaya* where *deepana-paacana* and *agni-guna* of these drugs help in the *paacana* of *aama* in the body.

Most of the contents of honey are reported for their anti-allergic<sup>[20]</sup>, anti-inflammatory<sup>[21]</sup> and anti-bacterial<sup>[22]</sup> properties. Having *madhura*, *kashaaya-rasa*, *seeta-veerya*, *katu-madhura vipaaka*, and *kaphavaata-saamaka*<sup>[23]</sup> properties of honey seem to be quite effective in antagonizing the *kaasa roga*, which is a *kaphavaata pradhaana* disease. Honey possesses the *kapha vaata saamaka* property and has *kaasa-hara* property also. The elimination of *kapha* releases the obstruction and free flow of *praana-vaayu* will be revealed in the form of improvement. Here the administration of honey relieves inflammation.

The pharmacological studies already reported on the individual drugs also favour the effectiveness

of various contents of *Srngyaadi coornam* and honey in *kaphaja kaasa*.

### Conclusion

In the present clinical study, regarding group A, highly significant result was found in all subjective parameters, whereas in group B statistically significant result was found. The effect of both drugs on blood picture was significant on the parameters of TLC, DLC, ESR, and AEC clinically and statistically, *Srngyaadi Leha* showed more effective results than that of *Srngyaadi syrup*. We can conclude that these treatments are safe and effective in the management of *kaphaja kaasa*.

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# Hyperthyroidism and its management with *ayurveda* - A case report

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**ABSTRACT:** Cases of thyroid dysfunctions are alarmingly increasing today. In India too, there is a significant burden of thyroid diseases. According to a projection from various studies on thyroid disease, it has been estimated that about 42 million people in India suffer from thyroid diseases. Hyperthyroidism is prevalent in people of developing countries. The present case report delineates history of a 32 years old female, who presented the complaints of palpitation, excessive hunger, weight loss, fine tremor of hands and legs and exophthalmos. Patient has been clinically diagnosed with hyperthyroidism [ICD-10 code E05.0] and further confirmed by laboratory tests. Patient has elevated thyroid hormone levels (raised thyroxin and/or triiodothyronine) and low or undetectable levels of thyroid-stimulating hormone (TSH). The patient underwent *snehapana*, *swedana* and *virecana*, followed by regular use of medicated milk prepared with *sataavari*, *saaribaa*, *candana* and *useera* for a period of one year. Reduction of symptoms and normalization of blood parameters started to appear after 2 months of the use of ayurvedic medicines. Patient was advised to taper modern medicine and stop gradually. The present findings show the effect management of *ayurveda*-formulations in the management of hyperthyroidism.

**Key words:** Hyperthyroidism and *ayurveda*- management, Thyrotoxicosis, Medicated milk.

## Introduction

Hyperthyroidism, also called thyrotoxicosis, a condition where the thyroid makes and releases high levels of thyroid hormone. This condition speeds up the metabolism due to excessive production of hormone. Symptoms of hyperthyroidism<sup>[1],[2]</sup> include tachycardia, weight loss, excessive sweating, heat intolerance, anxiety, irritability, palpitations, fatigue, bulging eyes, frequent bowel movements and fine tremor of hands and legs. Hyperthyroidism is characterized by low serum thyroid-stimulating hormone (TSH) concentrations and raised serum concentrations of thyroid hormones: thyroxin (T4), tri-iodo thyronine (T3), or both. Subclinical hyperthyroidism is characterized by low serum TSH, but with normal serum T4 and T3 concentrations. Hyperthyroidism is relatively rare than hypothyroidism. If not treated, hyperthyroidism can cause serious problems in

heart, bone, muscles, menstrual cycles and fertility. Globally about 1-5 % population are affected with hyperthyroidism. The prevalence of thyroid disorders in India has been studied. In an epidemiological study from Cochin, subclinical and overt hyperthyroidism were present in 1.6% and 1.3% of subjects participating in a community survey<sup>[3],[4]</sup>.

Hyperthyroidism simply means hyper function of the thyroid gland. It is associated with thyrotoxicosis, i.e., hyper metabolic state caused by elevated levels of T3 and T4. Hyperthyroidism might not be only cause for thyrotoxicosis. In hyperthyroidism, there is depressed level of TSH due to negative feedback mechanism.

Causes of hyperthyroidism include Graves' disease, thyroid nodule, thyroiditis, too much iodine and too much thyroid medicine.

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Ayurvedic classics have no direct reference on hyperthyroidism. Considering various factors it can be compared with *atyagni*<sup>[5],[6],[7],[8]</sup>, *teeksnagni* or *bhasmaka roga*(related to increase in *agni*). *Pitta prakopa* plays an important role in the pathogenesis and production of symptoms. Increase in *agni* causes rapid digestion and *pitta prakopa* symptoms like excessive hunger and sleeplessness.

### Case report

A 32 years old female patient presented with the following complaints

1. Palpitation
2. Excessive hunger
3. Weight loss
4. Anxiety and irritability
5. Sleep disturbance
6. Fine tremor of hands and legs
7. Exophthalmos
8. Fatigue
9. Frequent bowel movements

Blood test showed elevated T3 ,T4 level and low level of TSH. Thyroid scintigraphy was performed feature are suggestive of a hyperactive diffuse toxic goiter. After that she took Neomercazole 20 mg /day, as advised by the doctor.

Patient had these complaints for last one year with no other co morbidities. On examination in the OPD patient looked tired and had a blood pressure 100/70 mm Hg, pulse rate of 100/minute, temperature 97.2 degree Fahrenheit and respiratory rate of 20/minute. She had exophthalmos and enlarged thyroid gland. Lab investigation showed TSH <0.01 along with normal T3 and T4 levels. Thyroid scintigraphy was performed and the features were suggestive of hyperactive diffuse toxic goiter. She was put on Neomercazole 20mg /day and which has been continued for ten months. Even after doing so the symptoms and abnormality in TFT continued. So she decided to take *ayurveda* treatments and was undergone consultation (Table 1)

Date	T3	T4	TSH
3/3/2017	412	21.7	0.01
19/4/2017	164	9.9	0.01
18/5/2017	134	11.5	0.01
24/8/2017	129	11.5	0.01
6/11/2017	120	11	0.01

Apart from the signs and symptoms following were the observations.

### *Ashtasthaana pareeksha*<sup>[9],[10]</sup>

1. *Naadi*(pulse): 100/ minute
2. *Mala*(stool): Frequent bowel movements (4-5 times per day)
3. *Mootra*(urine): Normal
4. *Jihwa*(Tongue):Normal
5. *Sabda*: Normal
6. *Sparsa*: Hot in touch
7. *Drk*: Exophthalmos
8. *Aakrti*: *Krsaa*

### Materials and methods of ayurvedic treatments

1. *Snehapaana* with Tiktaka ghritham for 7 days – Starting dose:- 50 ml, Ending dose :- 200 ml (Table 2).
2. *Swedana* :- *Sarvanga swedana* on 9<sup>th</sup> day, 10<sup>th</sup> day and 11<sup>th</sup> day after applying Pindathailam.

Day	Dose	Remarks
1 <sup>st</sup> day	50 ml	Patient took porridge at 11.30 am, bowels- once/daily
2 <sup>nd</sup> day	75 ml	Patient took food at 12.30 noon, bowels- once /daily
3ed day	100 ml	Patient took food at 1.15 pm, bowels- twice /daily
4 <sup>th</sup> day	125ml	Patient took food at 1.45 pm, bowels- twice /daily, loose bowels
5 <sup>th</sup> day	150 ml	Patient took food at 2 pm, bowels- twice /daily, loose
6 <sup>th</sup> day	175 ml	Patient took food at 2.30pm, bowels- once /daily
7 <sup>th</sup> day	200ml	Patient took food at 3 pm, bowels- three /daily, loose bowels with oil

3. *Virecana*:- Avipathi choornam 20 g - on 12<sup>th</sup> day.

*Virecana* was done with Avipathi Choornam 20 gm. The powder mixed with warm water and taken at 6 am. Patient got 8 times loose bowel movement after that took porridge at 10.30 am. Then had *samsarjana karma* for three days.

4. Started medicated milk prepared as per *ksheerapaaka*, at bed time after 12 days of *virecana*. (Table 3).

Drugs	Botanical name	Quantity
<i>Sataavari</i>	<i>Asparagus racemosus</i>	5g
<i>Useera</i>	<i>Vetiveria zizanioides</i>	5g
<i>Candana</i>	<i>Santalum album</i>	5g
<i>Saaribaa</i>	<i>Hemidesmus indicus</i>	5g
Milk		100ml
Water		400ml

### Method of preparation

The medicines washed and crushed well and made into a potali, dipped in 100 milk added with 400 ml water, heated *in mandaagni* and reduced to 100 ml, filtered and use for drinking at bed time.

### Assessment criteria

Patient was regularly assessed on the basis of T3, T4 and TSH values and symptoms relief before and after treatments. Patient tapered and stopped Neomarcazole within 2 months of ayurvedic medicines.

### Result

Regular assessments were carried out in terms of symptoms and blood parameters. Improvement in symptoms was noted during the course of treatment. Palpitation rate reduced to normal level, burning sensation inside the abdomen disappeared within two months of using the milk decoction. Weight loss was found reduced viz., gained 68 kg weight from the level of 61 kg. The disturbance in the sleep disappeared and started to get sound

sleep within two months. Exophthalmus and fatigue disappeared gradually. Frequent bowel movements relieved. Fine tremor on the limbs were not manifested after the procedures (Table 4). The patient started improvements in TFT levels within 3 months and came to normal after 12 months of treatments (Table 5). *Samana* medicines were continued for a period of 10 months and discontinued. Patient did not have any complaints for the past 8 years, till the preparation of this article.

Symptoms	1 <sup>ST</sup> month	3 months	6 months	9 months	12 months
Palpitation	+++	++	++	+	0
Excessive hunger	+++	++	++	+	0
Weight loss	+++	++	+	0	0
Anxiety an irritability	++	++	+	0	0
Sleep disturbance	+	+	0	0	0
Fine tremor of hands and legs	++	+	+	0	0
Bulging of eyes	+++	++	+	+	0
Fatigue	+++	++	+	0	0
Frequent bowel movements	++	+	+	0	0

Date	T3	T4	TSH
5/2/2018	150	10.5	0.35
11/5/2018	159	8.2	0.75
4/8/2018	109.24	8.3	0.76
30/10/2018	106.3	9.2	1.35

### Discussion

*Ayurveda* classics have no direct reference of hyperthyroidism. Hyperthyroidism may be considered as *atyagni /bhasmaka* in *ayurveda*<sup>[11]</sup>. The symptoms of *vaataja pandu roga* (like *alpamedas*, *balakshaya*, *kampa* etc.) are also seen in hyperthyroidism. According to ayurvedic point of view, *nidaana* of subclinical hyperthyroidism is classified as *aahara*, *vihaara* and *maanāsika nidaana*. The *nidaana* of the condition attributed to improper and irregular diet, stressful life, lack of exercise, reduced sleep,

excessive thoughts, suppression of urges etc. The vitiated *doshas* include *vaata* and *pitta* and *dooshya* are *saptadhaatus* mainly *rasadhaatu*. Due to *vaatapitta prakopa* patient got good result with *snehapaana* and *virecana*.

According to *ayurveda* impaired digestion of food leads to the blockage of micro channels causing an imbalance in the functions of the thyroid gland. Higher levels of *vaata* and *pitta doshas* raise the metabolic rate and create the symptoms like excessive hunger, weight loss, anxiety and fatigue.

*Ayurveda* believes eradicating the root cause of problems to attain a permanent solution. It firstly address clearing possible blocks within the body, re-insisting the equilibrium and eventually resulting in the optimal performance of thyroid gland

*Snehapaana* with *Thiktakaghrita* performed to correct *doshavaishmya*. All the ingredients in the formulations are *vaatapittasamana*. *Svedana* widens the channels, enabling the movement of *aama* from the tissues back to *koshtha*. *Virecana* with *Avipathi choorna* helped to remove the *aama* from the body through *mala* and remnants of *vata pitta dosha* in our body. Medicated milk helped to maintain *vaata-pitta dosha* and nourished the *saptadhaatus*. The case reports consist of the unique presentation of a single case only. More clinical trials are recommended to arrive at a definite conclusion.

### Conclusion

On the basis of biochemical parameters and features in the present case of hyperthyroidism the above mentioned managements were very effective. But this is merely a single case report so the effectiveness of this treatment protocol cannot be claimed without further studies.

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# Analysis of Trace elements of medicinal plants used for cancer therapy by Flame Atomic Absorption Spectrometer

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**ABSTRACT:** The elemental analysis was carried out by using model of Thermo Scientific iCE 3000 Series at USIC Department, Gulbarga University, Kalaburgi, Karnataka, India. Flame Atomic Absorption Spectrometer (FAAS) technique is used to analyse 11 elements (Mg, Al, Si, Ca, V, Cr, Mn, Fe, Cu, Zn and Mo) in different medicinal plants, used for cancer treatment. Present study gives the information of the concentrations of trace elements in these samples located in North- Karnataka region of Kalaburgi district. These elements play a crucial role in the development and progression of cancer and recent findings had a significant impact on cancer treatment. These trace elemental concentrations are under the limits of national and international medicinal plants quality control bodies' viz., WHO/FAO.

*Key words:* Trace elements, medicinal plants, cancer, standard and Flame Atomic Absorption Spectrometer.

## Introduction

Cancer is a significant public health issue in both developed and developing countries, arising from various types of cells due to imbalances in the body<sup>[1],[2]</sup>. Major causes include smoking, diet, and hormone imbalances<sup>[3]</sup>. Breast and colorectal cancer are the most prevalent in women and men globally. Understanding the type, size, spread, and treatment response is crucial. Digestive track cancers are prevalent aging-related diseases<sup>[4]</sup>. Preventive measures include dietary changes, while chemotherapy and radiation treatments cause toxicity. Due to high death rates and side effects, patients seek alternative treatments<sup>[5]</sup>.

Micronutrients and trace elements are crucial for maintaining health and preventing diseases, including cancer<sup>[6]</sup>. Medicinal plants, rich in these elements, have been used for cancer treatment. They also serve as a reliable alternative to chemical drugs, providing 80% of rural residents with a safe alternative<sup>[7]</sup>. Most studies focus on essential oils, vitamins and glycosides, but little is known about the elemental composition of plants.

Medicinal plants contain both organic and inorganic constituents and the human body requires a number of constituents in order to maintain good health<sup>[8]</sup>. Most of the studies have been done on important constituents and little has been reported about the elemental composition of the plants<sup>[9]</sup>. Every constituent plays an important role in the formation of these compounds and deficiency of any constituent may lead to abnormal development in the human body<sup>[10]</sup>.

In this present analysis objectively, specific laboratory technique employed, such as Atomic Absorption Spectroscopy (AAS). This technique provides precise and quantitative data about the trace element content in ayurvedic medicinal plants.

## Materials and method

### Collection of medicinal plants

The images of different families of traditional medicinal plants such as *Milletia Pinnata*, *Cassia tora*, *Withania somnifera*, *Xanthium strumarium*,

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Table 1 List of medicinal plants selected for the current study						
SI.No	Botanical Name	Sample code	Common name	Local name	Family	Parts used
1	<i>Millettia pinnata</i>	HOA	karanja	Honge mara	Fabaceae	seed
2	<i>Cassia tora</i>	CHE	Sickle senna	Chagache	Fabaceae	Leaves
3	<i>Withania somnifera</i>	ASA	Ashwagandha	Ashwagandha	Solanaceae	Leaves
4	<i>Xanthium strumarium</i>	MAI	Common cocklebur	Murullumatti	Asteraceae	Leaves
5	<i>Nerium oleander</i>	KAO	Oleander	Kangalo huvoo	Apocynaceae	Leaves
65	<i>Euphorbia hirta</i>	HAA	Asthma tree	Hachhegida	Euphorbiaceae	Leaves

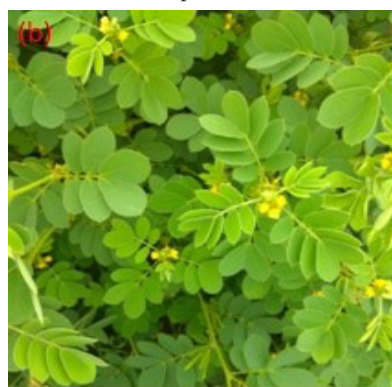
HOA- Honge mara (*Millettia pinnata*), CHE- Chagache (*Cassia tora*), ASA- Ashwagandha (*Withania somnifera*), MAI- Murullumatti (*Xanthium strumarium*), KAO- Kangalo huvoo (*Nerium oleander*), HAA- Hachhegida (*Euphorbia hirta*)

Figure 1

**Cancer Medicinal plants:** A) *Millettia pinnata*; B) *Cassia tora*; C) *Withania somnifera*  
D) *Xanthium strumarium*; E) *Nerium oleander*; F) *Euphorbia hirta*.



A) *Millettia pinnata*



B) *Cassia tora*



C) *Withania somnifera*



D) *Xanthium strumarium*



E) *Nerium oleander*



F) *Euphorbia hirta*

Nerium oleander, and Euphorbia hirta, and their selected parts (leaves and seed), which were collected from different places in Kalaburgi district in the North- Karnataka region, India. Table 1 and Figure 1 both provide illustrations of the list of medicinal plants together with their botanical names, common names, family names, and local names etc.

### Sample preparation and elemental analysis

These leaves and seed were washed in tap water and rinsed thoroughly with double distilled water in order to remove contamination, dried in shade laboratory at room temperature about 35 days and subsequently powdered by using Electrical Grinder. A quantity of pure 250 grams of each powder sample was weighted.

0.20g each of the powdered plant seeds and leaves samples digested in 7 ml of acid solution

(HNO<sub>3</sub>, H<sub>2</sub>SO<sub>4</sub>, HClO<sub>4</sub> in the ratio of 5:1:1). The corresponding solution was heated until white fumes had appeared. The clear solution was diluted up to 100 ml with distilled water and filtered with Whatman filter paper no.42, for the elemental analysis using FAAS technique.

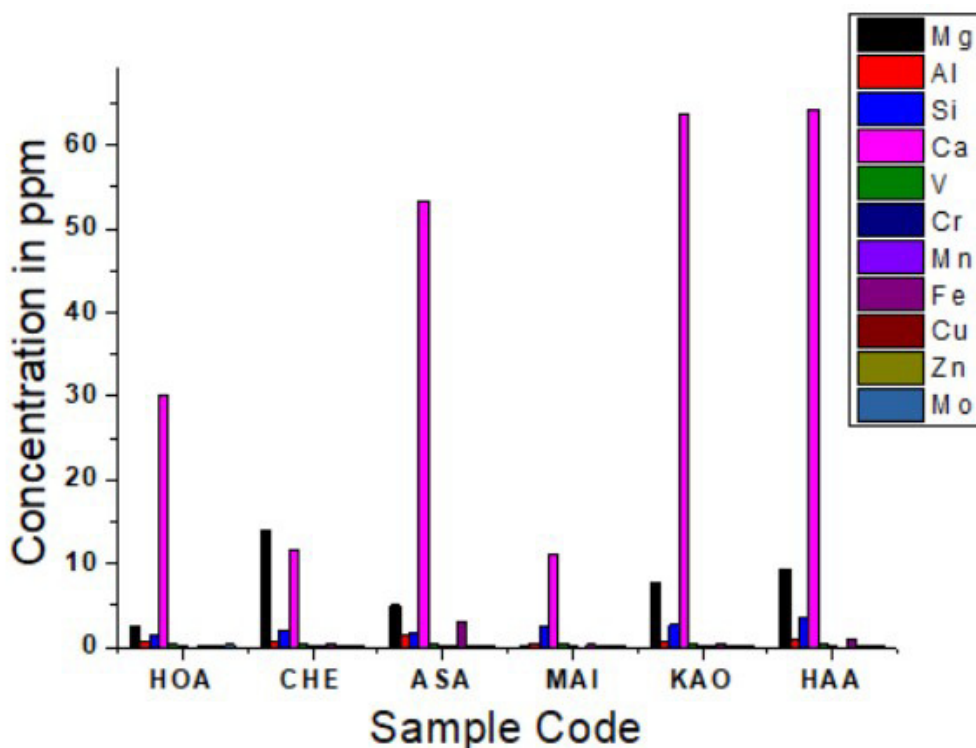
### Instrument

The “iCE 3000 series Atomic Absorption Spectrometer from Thermo Scientific” is the device used and is fully automatic for element identification. C<sub>2</sub>H<sub>2</sub> and N<sub>2</sub>O/C<sub>2</sub>H<sub>2</sub> flames are used with the AAS Spectrometer in this work.

### Results & discussion

The result of the current study is analyzing the 11 different trace elements namely Mg, Al, Si, Ca, V, Cr, Mn, Fe, Cu, Zn and Mo in 6 different families ayurvedic medicinal plants. The below Table 2 shows the data of the trace elements in various

Figure 2  
Concentration of elements in medicinal plants  
HOA- Honge mara, CHE- Chagache, ASA- Ashwagandha, MAI- Murullumatti, KAO- Kangalo huvoo, HAA- Hachhegida, Mg-Magnesium, Al-Aluminium, Si- Silicon, Ca-Calcium



proportions and the resultant variation of trace elemental concentrations in ayurvedic medicinal plants is mainly associate to the differences in botanical structure, as well as in the mineral composition of the soil in which the plants are cultivated.

Magnesium (Mg): High concentration of Mg found in *Cassia tora* (CHE), while low concentration of Mg found in *Millettia pinnata* (HOA) as shown Figures 2 and 3. Magnesium is essential for hundreds of biochemical reactions in the body, including DNA and RNA synthesis<sup>[11]</sup>.

Table 2  
The concentration of trace elements (ppm) in medicinal plants collected from Kalaburgi

SL. No.	Sample Code	Mg	Al	Si	Ca	V	Cr	Mn	Fe	Cu	Zn	Mo
1	HOA	2.49	0.5917	1.4233	30.13	0.2994	0.0277	0.0061	0.0119	0.1085	0.2524	0.3465
2	CHE	13.95	0.7099	1.9580	11.54	0.3390	0.0344	0.2050	0.4210	0.1338	0.1669	0.2066
3	ASA	5.03	1.4174	1.8051	53.33	0.4624	0.0310	0.0352	2.9506	0.1476	0.1779	0.1762
4	MAI	0.11	0.4639	2.6093	11.08	0.4939	0.0278	0.0121	0.3369	0.1729	0.1241	0.1076
5	KAO	7.70	0.7912	2.6661	63.74	0.4806	0.0256	0.0386	0.4551	0.1781	0.1136	0.0690
6	HAA	9.39	0.9612	3.6195	64.22	0.3411	0.0288	0.0242	0.9963	0.2273	0.1948	0.0783

HOA- Honge mara, CHE- Chagache, ASA- Ashwagandha, MAI- Murullumatti, KAO- Kangalo huvoo, HAA- Hachhegida.

Role of Mg to maintain adequate magnesium levels can help alleviate muscle cramps, fatigue and neuropathy, which are common side effects of certain cancer treatments<sup>[12]</sup>. Magnesium (Mg) is the second most abundant intracellular action in the body, involved with numerous biological activities, particularly related to its interaction with Ca<sup>[13]</sup>. Serum Mg levels, and Ca/Mg ratio have been shown to be associated with high-grade prostate cancer. Mg deficiency is linked to chronic inflammation, possibly due to the concentration Ca levels. Furthermore, it is speculated that Ca may play a key role in the progression of prostate cancer<sup>[14],[15]</sup>.

Calcium (Ca): High concentration of Mg found in *Euphorbia hirta* (HAA) and *Nerium oleander* (KAO) leaf, while low concentration found in *Cassia tora* (CHE) and *Xanthium strumarium* (MAI) as shown in Figures 2 and 3. Calcium, an essential mineral in the human body, has complex and multifaceted roles in various cellular processes, including cell signaling, muscle contraction, and bone health<sup>[16]</sup>. While calcium itself is not typically used as a primary treatment for cancer, it can indirectly influence cancer risk and may play a role in cancer management in

certain contexts<sup>[17]</sup>. Here are some aspects of calcium significance in relation to cancer. Calcium is crucial for maintaining strong and healthy bones. Many cancers, particularly breast and prostate cancer, can metastasize to the bones<sup>[18]</sup>. Adequate calcium intake and bone health are essential for preventing cancer-related bone complications, such as fractures and bone pain<sup>[19]</sup>. A number of studies have shown that dietary calcium intake is associated with a reduced incidence of colon cancer among middle-aged subjects<sup>[20]</sup>. Other observations suggested that alterations in essential trace elements like Cu, Fe, Zn and Ca may play an important role in the pathogenesis of this kind of cancer<sup>[21]</sup>.

Aluminum (Al): Low concentration of Al in all samples, as shown in Figure 2. Aluminum is a naturally occurring element found in various environmental sources, including soil, water, and certain foods<sup>[22]</sup>. While aluminum is generally considered safe in small amounts, concerns have been raised about its potential role in cancer development and other health issues, particularly<sup>[23]</sup> Silicon: High concentration of Si found in *Euphorbia hirta* (HAA), while low concentration found in *Millettia pinnata* (HOA)

as shown in Figure 2. Silicon does not have a direct role in the treatment of cancer<sup>[24]</sup>. Silicon is an essential trace element that is naturally present in the human body and plays a role in various physiological processes, such as the formation of connective tissues, bone health, and maintaining the health of skin, hair, and nails. However, it is not used as a primary or specific treatment for cancer<sup>[25]</sup>.

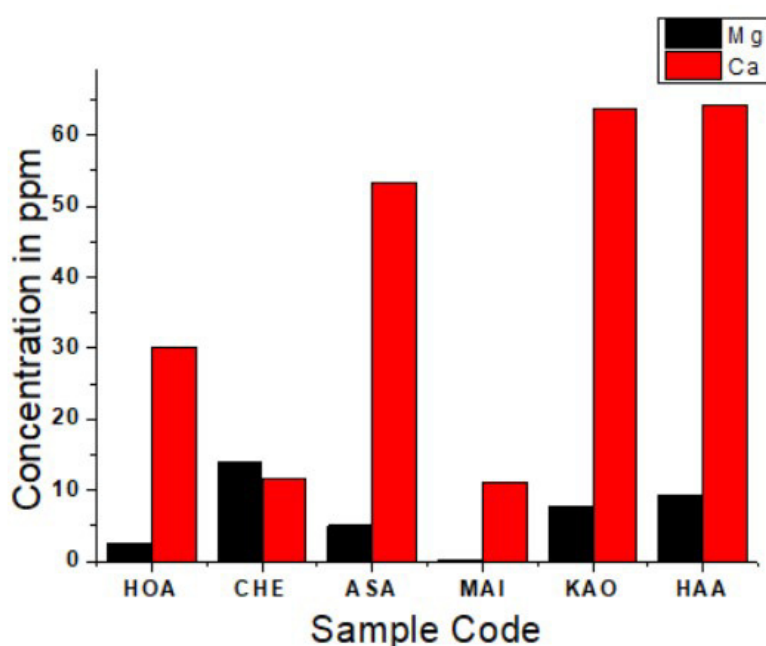
Vanadium (V): Low concentration of V found in all medicinal plants as shown Figure 2. Vanadium is a transition metal element that has been studied for its potential role in cancer treatment and prevention. However, its role in cancer therapy remains largely experimental and is not a standard or widely accepted treatment approach<sup>[26]</sup>. Here is an overview of the significance of vanadium in cancer research. Vanadium compounds, particularly vanadium salts, have been investigated for their potential anticancer properties<sup>[27]</sup>. Some studies have suggested that certain vanadium

compounds can inhibit the growth of cancer cells in laboratory settings<sup>[28]</sup>.

Chromium (Cr): Low concentration of Cr found in all ayurvedic medicinal plants as shown Figure 2. Chromium (Cr) is an essential trace element in the human diet, but its role in cancer treatment is not well-established<sup>[29]</sup>. Chromium has primarily been studied for its potential role in glucose metabolism, insulin sensitivity and its effects on various metabolic processes in the body. However, the significance of chromium in cancer treatment is limited and it is not considered as a standard or widely recognized cancer therapy<sup>[30]</sup>.

Manganese (Mn): Low concentration of Mn found in all medicinal plants as shown Figure 2. Manganese is involved in antioxidant defense mechanisms and the metabolism of carbohydrates, amino acids and cholesterol<sup>[31]</sup>. Manganese supports overall health during cancer treatment by assisting in the body antioxidant defenses and maintaining metabolic processes<sup>[32]</sup>.

Figure 3  
Comparison of the concentrations of Ca and Mg in medicinal Plants  
HOA- Honge mara, CHE- Chagache, ASA- Ashwagandha, MAI- Murullumatti, KAO-  
Kangalo huvoo, HAA- Hachhegida





Iron (Fe): High concentration of Fe found in *Withania somnifera* (ASA) while low concentration of Fe found in *Millettia pinnata* (HOA) as shown Figure 2. Iron is essential for carrying oxygen in the blood and for various cellular processes. While iron is crucial for normal body function, it can be problematic when it accumulates excessively<sup>[33]</sup>. Iron supplementation may be necessary for cancer patients who develop anaemia due to the disease or cancer treatments. However, excessive iron levels in the body have been associated with increased cancer risk, so iron balance is critical<sup>[34]</sup>.

Copper (cu): High concentration of Cu is found in *Euphorbia hirta* (HAA), while low concentration found in *Euphorbia hirta* (HAA) Figure 2. It is within the permissible limit (WHO). Copper is involved in angiogenesis (the formation of new blood vessels) and collagen production<sup>[35]</sup>. While copper is necessary for normal body functions, excessive copper can be harmful. Copper chelation therapy is sometimes used as an adjuvant treatment for certain cancers to inhibit angiogenesis, thereby preventing the growth of new blood vessels that supply tumours<sup>[36]</sup>. Copper (Cu) appears to play also an important role in the carcinogenic process. Colorectal cancer (CRC) is one of the most common cancers in men and women. The early diagnosis of colorectal cancer is promoted as a means to reduce the burden of the disease in society<sup>[37]</sup>.

Zinc (Zn): High concentration of Zn is found *Millettia pinnata* (HOA), while low concentration of Zn found in *Nerium oleander* (KAO) as shown in Figure 2. It is within the permissible limit (WHO). Zinc is an essential element for cell growth, DNA synthesis and immune function<sup>[38]</sup>. It is involved in numerous cellular processes including apoptosis (programmed cell death). Zinc supplementation may support the immune system during cancer treatment and aid in wound healing after surgery or radiation therapy. It can also help to prevent or

mitigate treatment-related side effects<sup>[39]</sup>. Zn levels seem to play a protective role also in lung cancer. In addition, it is suggested that low levels of zinc can facilitate the pathogenesis of lung cancer<sup>[40]</sup>.

Molybdenum (Mo): Low concentration of Mo in all ayurvedic medicinal plants as shown in the Figure 2. Molybdenum does not play a direct role in the treatment of cancer<sup>[41]</sup>. It is an essential trace element required by the body in very small amounts for various biochemical processes, including the metabolism of certain amino acids and the detoxification of harmful compounds. While molybdenum is important for overall health, it is not used as a primary treatment for cancer.

### Conclusion

The present investigation provides information on the trace elemental concentrations of ayurvedic medicinal plants in the North-Karnataka regions. A total of six different ayurvedic medicinal plants were collected and examined by using flame atomic absorption spectrometer (FAAS) technique. Moreover, the present analysis shows that all detected elements are within the permissible limits of WHO/FAO and some other standard permissible limits for medicinal plants. The presented studied data is useful to the new researchers and medicinal practitioners to prepare new health drugs and promote society. The secondary metabolites of medicinal plants and the human body also help to study the phytochemical compounds, which have some antimicrobial properties like cancer. The analyzed trace elemental concentrations' viz., Mg, Al, Si, Ca, V, Cr, Mn, Fe, Cu, Zn and Mo are under the limits of national and international medicinal plants quality control bodies' viz., WHO/FAO.

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# Enhancing nutritional security and promoting women empowerment in India through value chain interventions on minor millets

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**ABSTRACT:** India faces a significant nutrition challenge. Previous interventions to improve food and nutrition security have not been successful and women's important contributions to agriculture and biodiversity conservation have been ignored. This paper shares lessons learnt in the framework of a project undertaken by Bioversity International, supported by the International Fund for Agricultural Development on neglected and underutilized species (NUS), which intended to mainstream nutritious minor millets, which appear to be able to make a significant contribution of interlinked livelihood goals in India. The paper concludes with recommendations for research, sustainable agriculture, government actions, value chain interventions and mainstreaming of NUS.

*Key words:* :minor millets, nutrition, food security, women's empowerment, food policy, India

## Mainstreaming minor millets in India

Ideally, agricultural and poverty-reduction strategies should be aimed at improving access to adequate dietary variety for vulnerable population groups. However, historically various governmental food security plans in India appeared not to have taken this principle into consideration and in some cases, even led to a worsening of dietary diversity; by marginalizing nutritious-rich traditional crops and bypassing the participatory role of women in agriculture, nutrition security and biodiversity conservation. . Based on past research findings, Bioversity International and the M.S. Swaminathan Research Foundation (MSSRF) have been testing out novel approaches to enhance the food and nutrition security of rural people, focusing specifically on minor millets. Minor millets are a very good example of how neglected and underutilized species (NUS), can effectively contribute to a variety of closely inter-linked livelihood goals, such as food and nutrition security, health, women's empowerment and

increased income for the rural poor. The article starts by reviewing India's current nutrition challenge and analyzes the strategic role played by minor millets in nutrition security and concludes with policy recommendations needed to mainstream agro-biodiversity-based practices into government actions.

## India's nutrition challenge

India is facing a significant nutrition challenge. UNICEF statistics show that the burden of wasting (abnormal low weight for height and indicator of acute malnutrition) is highest in India, which has more than 25 million wasted children. This exceeds the combined burden of the next nine high-burden countries. Similarly, India is home to greatest absolute burden of stunted children (abnormal low height for age). This condition, an indicator of chronic malnutrition, in such a highly populated country, accounts for 38% share of the world's stunting burden. As per the latest estimations in Sub-Saharan Africa 21 % of children

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under five are underweight (abnormal low weight for age), whereas in India and South Asia this prevalence is 43 % and 33 % respectively <sup>[1]</sup>. Furthermore, 28% of the infants are born with a low birth weight ( $\leq 2,500$  grams at birth), and have a greater chance of suffering from child morbidity or mortality. Of the ones who survive infancy, many will be suffering from cognitive and neurological impairment and will be stunted as adults<sup>[2]</sup>. Malnutrition is also reflected in the statistics for adults. According to the National Family Health Survey held in 2005-2006 (NFHS-3, 2007), 71.1% of Indian women and 67.4 % of men aged 15-49 have a body mass index (BMI) lower than 18.5.

#### **Iron deficiency anemia in India**

Undernourishment is an important cause of micronutrient deficiencies, including iron deficiency. Iron deficiency anemia is one of the most prevalent micronutrient deficiencies worldwide. Iron deficiency in infants and young children, can lead to impaired psychomotor development, coordination and scholastic achievement, and reduced physical activity levels. Amongst pregnant women, iron deficiency anemia is associated with an increased risk of maternal mortality, maternal morbidity and obstetrical complications. The unborn child risks intrauterine growth retardation, low birth weight and fetal morbidity and mortality<sup>[3]</sup>. Anemia remains one of the most important indirect causes of maternal mortality in India <sup>[4]</sup>.

The NFHS-3 conducted in 2005-2006 shows that 55% of Indian women, 24% of Indian men and 59% of pregnant women are anemic. For children these figures are even worse: 70% of the children aged 6-59 months are anemic, 26% are mildly anemic (hemoglobin level of 10.0-10.9 g/dl), 40% moderately anemic (7.0-9.9 g/dl), and 3% severely anemic (less than 7.0 g/dl). In fact, the condition is so common that in all but 4 states (Goa, Manipur, Mizoram, and Kerala) more than half of children are anemic. Since 1998-1999 the

prevalence of anemia has only increased<sup>[4]</sup>. Due to the high prevalence of anemia in the country, iron deficiency in India deserves a high priority. The main reasons identified as the cause for this prevalence are low dietary intake and poor bioavailability. These factors should be included in interventions, which aim to reduce anemia.

Child malnutrition is responsible for 22% of the country's burden of disease in India<sup>[1]</sup> and is undoubtedly India's biggest public health problem<sup>[5]</sup>. Despite India's efforts to improve nutritional status programs such as the integrated Child Development Services Programme and the Public Distribution System (PDS) (Ramalingaswami, Jonsson, and Rohde 1996; Kataki 2002<sup>[6]</sup>, there has only been a marginal reduction in the percentage of young children who are stunted and underweight. In fact the percentage of young children who are wasted has slightly increased<sup>[7]</sup>. With an average annual rate of underweight reduction of only 0.9% between 1990 and 2008, India has made insufficient progress towards reaching the millennium development goal no.1.c: to halve, between 1990 and 2015, the proportion of people who suffer from hunger (UNICEF 2008<sup>[1]</sup>). Thus, it can be concluded that greater efforts need to be made in India to reach nutrition security: Adequate nutritional status in terms of protein, energy, vitamins, and minerals for all household members at all times<sup>[8]</sup>.

#### **Green revolution and nutrition**

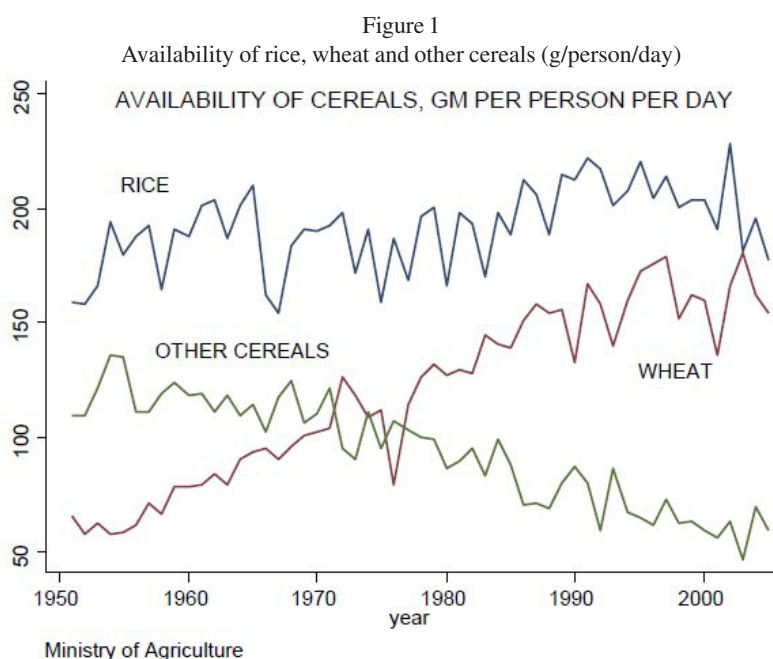
During the green revolution, improved crop varieties, irrigation and a dramatic increase in petroleum based inputs such as pesticides and fertilizers resulted in an enormous increase in yield in Asia in the late 1960s<sup>[9]</sup>. Researchers at the International Rice Research Institute (IRRI) and the International Maize and Wheat Improvement Center (CIMMYT), together with national research programs developed modern short-duration high-yielding varieties (HYVs) of wheat and rice which could grow at any time of the year and responded much better to fertilizers<sup>[10]</sup>. Since

the yield and profitability of those new crops was higher, more and more farmers started to cultivate wheat and rice at the expense of traditional crops. As a result, cereal production in Asia doubled between 1970 and 1995<sup>[11]</sup>. In India during the 1970s and 1980s, farmers used land to cultivate wheat and rice; therefore, eliminated pulses and coarse cereals, such as millets, from the fields. This resulted in a sharp increase in the price of pulses, and thus a drop in the per capita

consumption<sup>[12]</sup>. Pulses are an essential source of protein in Indian diet and displacement of pulses from diet decreased the supply of utilizable essential amino acids due<sup>[13]</sup>. Table 1. shows the supplies of basic foodstuffs in India from 1960 to 1995. It is argued however that despite the increase in per capita protein from plants shown here. The availability of coarse cereals has declined by more than half the initial amount, over the last fifty years (Figure 1). Despite some

Table 1 Per capita supplies of basic foodstuffs in India 1960-1995 (kg/person/year)					
Commodity	1960	1970	1980	1990	1995
Rice	72.1	68.1	67.5	78.0	76.5
Wheat	27.8	35.7	45.7	53.7	58.3
Coarse cereals	44.0	42.9	36.3	31.3	28.8
Pulses	23.0	16.6	12.5	13.7	13.3
Total Food grains	66.9	163.3	162.0	176.7	176.9
Vegetables	37.0	42.5	47.7	52.2	74.0
Fruits	26.5	26.2	26.5	28.7	34.8
Starchy roots	10.4	17.0	19.7	19.8	21.3
Sugars	19.2	19.2	19.9	22.7	23.1
Vegetable oils	4.1	4.1	5.3	6.5	7.1
Milk <sup>a</sup>	38.6	33.6	39.2	54.7	60.2
Meat <sup>b</sup>	5.9	6.9	7.5	9.4	9.9

NOTE: All quantities based on three-year averages  
<sup>a</sup> Cow, buffalo and goat milk <sup>b</sup> Beef, mutton, pork, poultry, egg and seafood  
 SOURCE: Data from Hopper (1999)<sup>[13]</sup>



NOTE: 'Other cereals' are mainly the "coarse" cereal group consisting of maize, barley, jowar (sorghum), ragi (finger millet) and bajra (pearl millet) SOURCE: Deaton and Drèze (2009)<sup>[14]</sup>.



temporary increases, the declining trend of availability has long been established<sup>[14]</sup>. Although wheat production between 1983 and 2005 increased ten-fold and rice production four-fold, Deaton and Drèze (2009) report a decline in energy intake per capita in India; from 2,240 to 2,047 kcal for rural populations and from 2,070 to 2,021 kcal for urban populations. These values are below the Recommended Dietary Allowances (RDA) given by Indian Council of Medical Research (2009), 2730 kcal/day for a man and 2230 kcal/day for a woman doing moderate work.

The Asian Green Revolution brought a rice-wheat rotation which resulted in the displacement of grain and fodder legumes helpful in ameliorating soil fertility<sup>[15]</sup>, along with a narrowing of the food base. Research and extension programs have focused mostly on few crops, namely maize, wheat and rice which supplies the bulk of the protein and energy needs for India. The large dependence on a narrow range of cereal crops and varieties determined the loss of biodiversity on farms<sup>[11][16]</sup> and contributed to a severe reduction of dietary diversity<sup>[13]</sup>. Crop and dietary diversification strategies improve long-term sustainability of the food resources in communities, particularly when traditional knowledge and socio-cultural values of the community are being considered<sup>[17][18]</sup>. Higher dietary diversity positively influences nutritional status of the population and lower the incidence of all forms of malnutrition<sup>[12]</sup>.

The Green Revolution apparently improved food security since it raised income for some of the farmers, increased per capita availability of cereals through an increase in production and was able to reduce food prices. Critics however noted how this was not the case in many marginal areas where HYV performed insufficiently due to poor soil conditions or because of the lack of agricultural inputs, which were often unavailable to the majority of poor small holder farmers. Some detractors also point out that HYVs were

dependent on huge amounts of fertilizers, which have toxic properties when they are administered without sufficient water. Availability of water for irrigation is also often cited as an additional drawback in the adoption of HYVs. The densely planted, nitrogen rich, irrigated plants appeared to be very vulnerable to herbivores, pests and plant diseases and, as a solution to this problem, new synthetic pesticides were developed, creating a further dependence on biotech agricultural corporations<sup>[19]</sup>.

#### **Getting back to local food systems**

The Asian green revolution clearly demonstrated that by only introducing HYV and increasing food production, India's malnutrition problem cannot be solved sustainably. Such a condition is now even further aggravated by climate change. There is a growing understanding that in order to contribute effectively to reducing malnutrition in India, a change of paradigm is needed whereby dietary diversification, the nutritional value of traditional crops and their beneficial effect on the agro ecosystem are fully recognized, valorized and promoted.

Many of the secondary food grains such as pulses, which are important sources of protein in traditional Indian vegetarian diets, as well as millets such as sorghum, pearl millet and finger millet, which serve as staples in dry land areas, are rich in micronutrients. Unfortunately, they have been underemphasized by research and development and policy. Another factor contributing to a decrease in cultivation and intake of these food grains of the traditional Indian diet, is their marginalization by society. Millets, for example, are erroneously considered poor man's food and a sign of cultural and technical backwardness<sup>[20]</sup>.

#### **The Policy gap**

Secondary food grains have been neglected by research and policy. The 10th Five Year Plan, developed by the Indian planning commission in 2002<sup>[4]</sup>, shows how millets have not been receiving

the required policy support, until a decade ago the consumption of coarse cereal declined, for example in Uttar Pradesh, it declined from 5.0 kg per capita per month in 1972-1973 to 0.8 kg per capita per month in 1993-1994, while the consumption of rice and wheat increased: for rice from 2.6 kg per capita per month to 3.5 kg and that of wheat from 6.1 kg to 8.1 kg per month. The Indian government argued that as *'rice and wheat are the basic necessities for the poor'*, cannot be expelled from purview of Targeted Public Distribution System (TPDS), therefore indicating that food subsidies should be restricted to these two commodities. Despite the fact that coarse cereals cause lower environmental damage during production, they were advocated not to be included in PDS, as there was no standard variety and also due to their shorter shelf life. Furthermore, in point 3.4.24. e/f it is explicitly mentioned that all further attempts to include additional commodities under the coverage of food subsidy should be resisted. In addition, the government only provided a one-time supply of 100 kg of wheat or rice to each grain bank managed by the community-based support systems (Planning Commission, 2002, GOI). These strategies made only rice and wheat affordable to the poor, making other crops like minor cereals and pulses too costly. This reduced the dietary diversity of Indian diet and led to widespread of micronutrient deficiencies. In the 11th Five-Year Plan (2007-2012), the government of India acknowledges the need for diversification of diets to combat nutrient deficiencies, stating that the availability, consumption of, and access to different types of micronutrient-rich foods should be improved. With nutrition security being one of the considerations of the TPDS, it includes other commodity crops such as pulses. The National Development Council (NDC) therefore adopted a resolution to initiate a National Food Security Mission in 2007 with goal to increase production of rice (by 10 MT), wheat (by 8 MT) and pulses (by 2 MT) by 2011/12, however,

nutritious-rich minor millets were left out. The latest Five-Year Plan (2012-2017) (Planning Commission Government of India 2013) makes further steps in acknowledging the importance of millets: (1) calling on crops that *"can withstand climate stress"* (cfr page 229 of Vol. 1); (2) calling for additional 2 million tons of production of millet<sup>1</sup> through the NSFM (National Security Food Mission launched through the previous Five-Year Plan) (cfr page 42 of Vol. 2); and (3) advocating actions to *"ensure food and nutrition security at household level by making the essential food grains (rice, wheat and coarse grains), edible oils and sugar available through the Targeted Public Distribution System"* (cfr page 217 of Vol. 3). However, more supportive policies was approved by the Parliament of India only last 12 September 2013<sup>2</sup> under National Food Security Bill, (known also as the Right to Food Bill) where the Indian Government is committed to provide subsidized food grains to app. 2/3 of India's 1.2 billion people. For the first time, the Government refers to coarse cereals (category that includes minor millets) in addition to rice and wheat, which was received by many observers as a great achievement in the direction of strengthening nutrition security in the country. Detractors argue that the Bill fails however to find proper remedies to the root causes of malnutrition in the country such as access to water, sanitation facilities and public health education and other issues like poor infrastructures in food delivery systems, scarce attention to sustainable farming methods, and poor land use. With regard to the implications that the Bill will have on the production of minor millets, it is worth reflecting that a well thought out mechanism for the production of minor millets is now needed by the country. Considering the different degrees of production levels of minor millets across India, many observers advocate that the States, rather than the central Government, should implement production of these crops in harmony with local crop cultivation patterns and demands.

One of the key individuals behind the inclusion of minor millets in the Food Security Bill is Prof. M.S. Swaminathan who has been advocating in many fora the need for developing an enabling environment for the promotion of minor millets. During the 36<sup>th</sup> Session of the Committee on World Food Security on October 11, 2010, Prof. Swaminathan, as the Chairperson of the Steering Committee of the High Level Panel of Experts on Food Security and Nutrition stated that, "*The solution for the food and nutrition security problem requires interventions generating a synergy among technology, public policy and farmers' efforts*". One of the difficulties in forming such a synergy is that there is a need to pursue actions on solid ground in order to ensure sustainable effects. He therefore advocates political decisions that promote community level food security systems based on climate resilient farm technologies and further stressed that priority should be given to the inclusion of nutrition-rich in the food basket<sup>[21]</sup>. In the light of the recently approved Indian Law, we can now say that Swaminathan's advocacy has been highly successful and Bill can set the example for similar policy interventions in other countries.

### **Empowering women as the custodians of nutrition security and biodiversity conservation**

To maximize the effect of agricultural interventions for nutrition outcomes the most effective results are obtained when technology interventions are complemented by investments in nutrition education and health services, and targeted in such a way that women are empowered with additional spending power<sup>[22]</sup>. During the Asian Green Revolution, poor attention was paid to female-dominated traditional agriculture and knowledge and as advanced, often bypassed regardless of the fact that women contribute substantially to macro-level food security. Women, in fact, were displaced from their traditional roles in agriculture, partly as a

result of mechanization<sup>[23]</sup>. After all, according to the United Nations Development Programme (UNDP) Human Development Report of 2004, 74% of women are economically active in agriculture, having an essential role in the value chain of crops, thereby contributing to nutrition security at the household level<sup>[24]</sup>.

Due to different experiences and activities, women and men have different but complementary knowledge on plant species. This gender differentiated knowledge is of great importance for the sustainable conservation and use of agro biodiversity. Women in fact select the varieties which, in their opinion, are most useful on a household and community level<sup>[25]</sup>. Women have been found to reflect in a more comprehensive way on detailed criteria like taste, color, size, texture, cooking time, crop yield, ease of processing and access, grain formation and resistance to pests and insects when selecting varieties. These selection skills, which have been developed over years of experience aim at diminishing households' risks<sup>[26][27]</sup>. Male farmers on the other hand, select varieties according to male's main responsibility, mostly income generation and therefore high yield and good market price receive higher priority<sup>[28]</sup>. In smallholder agriculture, women farmers are often in charge of the selection, improvement and adaptation of plant varieties<sup>[25]</sup>. A study performed in India showed that empowering women by giving them increased decision-making authority in participatory variety selection (PVS) of rice, improved the development of varieties best suited to the environment<sup>[29]</sup>, which under changing environments is important to ensure food security. The same study showed an increase in confidence amongst women in their decisions and opinions. In most countries, women focus mostly on subsistence production of food crops, on farms or in home gardens, whereas men take care of commercial farming. But for women farmers to contribute more effectively to food and nutrition

security, they need access to land, management control of land-based resources and the economic incentives<sup>[30]</sup>. During the green revolution women lost influence and control over production and access to resources, men frequently could take advantage of extension services and had the ability to purchase seeds, fertilizers and the necessary technologies. Women and men use different networks, including formal and informal community based networks, for exchanging seeds<sup>[28]</sup>. After harvesting, the processing and storage of food crops is also mainly a job of the women<sup>[26]</sup>. Women from poor households practise a variety of income-generating and expenditure-saving activities that can supplementing male contributions or can represent the primary or sole source of household livelihoods..

A study on demographic and health surveys data related to 117,242 children, under three years of age in 36 developing countries, demonstrated that the status of women is an important determinant of child nutritional status. Women with low status tend to have weaker control over household resources, tighter time constraints, less access to information and health services and lower self-esteem. These factors are directly associated with women's nutritional status and the quality of care they received, and in turn to children's birth weights and the quality of care they receive<sup>[31]</sup>. Furthermore, many studies have revealed that income or properties controlled by women are more likely to be spent on or used for items that benefit children, such as food, clothing and health care,<sup>[32] [33]</sup> while men are more likely to spend a considerable part of theirs on personal goods such as alcohol, tobacco, etc.<sup>[34]</sup>. Research in several developing countries of Asia, Africa and Latin America demonstrated that advancements in household food security and nutrition are related to women's access to income and their role in household decisions on expenditure<sup>[30]</sup>. Women also play a key role in determining which food and other products to maintain at home for consumption and which to sell at the local

market<sup>[26]</sup>. A study conducted in Andhra Pradesh, India, showed that interventions are needed in two dimensions of female autonomy (financial and physical) which, both/independently affect child growth<sup>[35]</sup>.

#### **IFAD-NUS Projects: The First UN Project on neglected and underutilized species**

If we are to address food security effectively, a change in paradigm is needed. Frison (2006) states *"In view of current knowledge of synergies in the physiologic functions of nutrients, the focus of interventions needs to be on improving overall diet quality while at the same time improving the wellbeing of rural and urban population"* (Frison et al. 2006)<sup>[17]</sup>. Recognizing other important determinants of nutritional security, such as healthcare, childcare and food access<sup>[36]</sup>, the authors believe that, for the purpose of addressing the nutrition challenge, minor millets (and other NUS) can make a huge difference in India. Minor millets, having a unique strength to counter hidden hunger as it has so much micronutrients<sup>[37]</sup>, are essential in fulfilling the macro and micronutrient requirements and crucial in reversing the poverty-micronutrient malnutrition trap in developing countries<sup>[17]</sup> and thereby contribute to wholesome nutrition security. This is the rationale that has guided the interventions of the IFAD-NUS project carried out between 2002 and 2010, which we shall describe in the following sections.

The outcomes of the IFAD-NUS project will be used to answer the key question behind the main objective of this paper, that is 'how can the promotion of minor millets contribute to nutrition security and women empowerment in India' Our discourse will be supported also by findings emerged through an external evaluation carried out on the IFAD-NUS project<sup>[38]</sup> and subsequent impact assessment studies made by Bioversity<sup>[39]</sup>,<sup>[40]</sup>.

In 2002, the IFAD funded project "Enhancing the contribution of neglected and underutilized species



to food security and to incomes of the rural poor, Asia Component-Nutritious Millets” was launched in 7 countries across Latin America, North Africa, West and South Asia (where India was among the participating countries). The project was coordinated at the international level by Bioversity International and by the M.S. Swaminathan Research Foundation for the South Asia component. Later, in 2007, as a follow up initiative, IFAD approved a three year program, “Empowering the rural poor by strengthening their identity, income opportunities and nutritional security through the improved use and marketing of neglected and underutilized species”<sup>[39]</sup>. The project adopted a community-based, multi-stakeholder and inter-disciplinary framework. It was implemented as a whole in 31 villages spread across four Indian states (Tamil Nadu, Orissa, Karnataka and Uttarakhand) all of which have different agro-ecological, economic, ethnic and cultural conditions: marginal agricultural lands with scarce rainfall in the Deccan plateau, hilly rain fed regions in the Eastern Ghats and highly fragile subtropical to temperate Himalayan Mountains. The project was estimated to influence around 753 households. Recognizing their nutritious qualities and importance in climate change adaptation, the IFAD-NUS project in India included finger millet (*Eleusine coracana* L.), foxtail millet (*Setaria italica* L.), little millet (*Panicum sumatrense*) and barnyard millet (*Echinochloa crusgalli* and *E. colona* (L.)). Interventions were undertaken to make them a viable income source and a nutritious food option. Genetic material and information on its conservation and use was provided to farmers by establishing village gene-seed-grain banks; better varieties were developed by Participatory Varietal Selection; cultivation practices were improved; more efficient processing technologies were developed; nutritional and industrial values of crops and products were characterized; sustainable enterprises were initiated; community

members were trained and public awareness was raised.

#### **The role of minor millets in nutrition security**

Minor millets were selected by the project due to their hardiness, resilience to varied agro-climatic dangers and importance in marginal agriculture, as well as the fact that they also played an essential role in food and nutrition security of the people living in the project’s area. When assessing the role of NUS in food and nutrition security, it should be stressed that other characteristics than just the caloric content of the plant should be taken into consideration. Minor millets play in fact an important role in the food and nutritional security of the poor, due to their excellent content in macronutrients, minerals, vitamins and fibers. Based on that, they should be rather called ‘nutritious millets’. Minor millets contain all essential amino acids needed for an adequate diet<sup>[41]</sup>. From Table 1.5.1 we can appreciate that compared to rice -the main staple food in India- they are higher in protein. The common feature of minor millets is that lysine is the most limiting amino acid and therefore millets diets should be complemented with legumes to fulfill protein needs<sup>[42]</sup>. On the other end, the sulphur-containing amino acid content in finger millet is equal to that of milk protein<sup>[43]</sup>. Interestingly, the fermentation of finger millet increases the percentages of free amino acids, as protein binding phytates are degraded during the fermentation process, thereby improving the bioavailability<sup>[43]</sup>.

Literature shows that the fat from finger millets contains the essential fatty acid linoleic acid<sup>[44]</sup>. Fat content of finger millet (1.5-2.0%), although low, is high in polyunsaturated fatty acids (PUFA)<sup>[43]</sup>. PUFAs are preferred over saturated fatty acid because they reduce the risk of cardiovascular disease.

Kamath and Belavady (1980) found that small millets are superior to rice and wheat as a source of dietary fiber. The total dietary fiber in finger



millet (18.6%) was higher than that in sorghum (14.2%), wheat (17.2%) and rice (8.3%)<sup>[45]</sup>. Worth noting that adequate fiber intakes has potential health benefits such as normalization of bowel movements and helping maintain bowel health, lowering of cholesterol levels, helping control blood sugar levels and aiding in achieving healthy weight<sup>[46]</sup>.

For these reasons, minor millets could be excellent ingredients for the preparation of fiber-rich healthier bread products<sup>[47]</sup>. Diabetes constitutes a severe health problem in India, which has the highest incidence of this disease worldwide. WHO reported in 2000 that 31.7 million of people suffering from this ailment and by 2030 incidence is predicted to rise to 79.4 million (WHO 2013). Diets containing kodo (*Paspalum scrobiculatum*) and finger millet flour have been found to have potential benefits to mitigate or delay the onset of diabetes related complications, since they can reduce blood glucose, lower blood cholesterol and protect against alloxan-induced oxidative stress in diabetic rats and these positive effects are attributable to the fiber and antioxidant phenolics found in these crops<sup>[44]</sup>.

Starchy foods which are digested gradually and are followed by a lower blood glucose response are more beneficial to health and for the management of diabetes and hyperlipidemia<sup>[48]</sup>.

They have a low glycemic index (measure of the effect of carbohydrates on blood sugar levels). Some of the products produced by using minor millets have a low glycemic index, meaning 55 or lower<sup>[49]</sup>. For example Laddu, an Indian sweet which is an integral part of most Hindu festivals and celebrations, prepared with foxtail millet, has a glycemic index of only 24, whereas other products prepared with minor millets have a higher glycemic index. These are for example, ragi made of finger millet, which has a glycemic index of 68, classifying the product in the category of medium glycemic index (56-59)<sup>[50]</sup>. As a reference, products such as white bread, cornflakes and donuts have a high glycemic index (>70).

Consumption of finger millet based diets has been reported to result in significantly lower plasma glucose levels than consumption if diets based on rice or wheat due to the higher fiber content of finger millet<sup>[51]</sup>. On the other hand, an earlier study concluded that finger millet is not very effective in lowering blood glucose levels<sup>[52]</sup>. Further studies seem to be warranted to confirm that since it is also argued that recipes used to process finger millet in this work might have had an influence on its outcome.

From Table 2 the great advantage of millets becomes even more apparent when iron (Fe) and calcium (Ca) content are to be considered.

Table 2  
Nutrient composition of minor millets and other cereals (per 100g edible portion)

Food	Protein	Fat (g) (g)	Carbo- Hydrate(g)	Ca (mg)	Fe (mg)	Vitamin B1 (mg)	Vitamin B2 (mg)	Vitamin B1 (mg)
Rice (brown)	7.9	2.7	76	33	1.8	0.41	0.04	4.3
Wheat	11.6	2	71	30	3.5	0.41	0.1	5.1
Maize	9.2	4.6	73	26	2.7	0.38	0.2	3.6
Sorghum	10.4	3.1	70.7	25	5.4	0.38	0.15	4.3
Pearl millet	11.8	4.8	67	42	11	0.38	0.21	2.8
Finger millet	7.7	1.5	72.6	350	3.9	0.42	0.19	1.1
Foxtail millet	11.2	4	63.2	31	2.8	0.59	0.11	3.2
Proso millet	12.5	3.5	63.8	8	2.9	0.41	0.28	4.5
Little millet	9.7	5.2	60.9	17	9.3	0.3	0.09	3.2
Barnyard millet	11	3.9	55	22	18.6	0.33	0.1	4.2
Kodo millet	9.8	3.6	66.6	35	1.7	0.15	0.09	2

SOURCE: Data from Hulse, Laing, and Pearson (1980)

Compared to rice and wheat, finger millet is in fact extremely high in calcium, the highest content among all cereals (334 mg per edible portion)<sup>[53]</sup>. Of these 334 mg, only 162 mg/100 g is bioavailable in the raw grain, however processing by fermentation and germination improves its bioavailability to 227 mg/100 g<sup>[54]</sup>.

The same is true for the products made with little millet and foxtail millet: In table 3 it is shown that calcium content of 100 g of *paddu* prepared with little millets (94 mg) is much higher than when

Nutrient	Rice	Little millet
Calories(kcal)	667	643
Protein(g)	19	21
Fat(g)	11	13
Carbohydrates(g)	123	112
Crude fibre(g)	1	12
Calcium(mg)	69	94
SOURCE: Gopalan (1989) <sup>[53]</sup> .		

these food items are prepared with rice flour (69 mg). Dietary calcium intake of both the urban and the rural populations in Southern India is low compared with the recommended dietary allowance of 600 mg/d. Poor calcium status can lead to a defect in mineralization of bone, rickets in children and osteomalacia in adults<sup>[55]</sup>. Finger millet could be used to overcome the calcium deficiency of a rice diet. The investigations made in the IFAD-NUS project to assess the nutrition/health outcomes have also showed that in Karnataka State women's adequate dietary level of calcium was directly linked to their consumption of finger millet<sup>[56]</sup>. Iron deficiency occurs when diets are based mostly on staple foods and include little meat (WHO 2002). This can be seen in India where meat consumption is very low and depends heavily on income class<sup>[13]</sup>. Regarding the strong limitations iron deficiency anemia sets on human and national development, attention should be paid to the iron content of crops used as staple food. Mainstreaming minor millets as a nutritious food

can bring substantial benefits in addressing iron deficiency anemia in India. Table 2 shows that compared to rice and wheat, especially barnyard and little millets contain much more iron. Iron from plant source is less easily absorbed than iron from meat source, but processing the finger millet will improve its iron availability<sup>[54]</sup>.

During the IFAD-NUS project, the nutritional status of children, fed for three months with ragi (finger millet) or foxtail millet was assessed. Children fed with millet showed an improvement with respect to weight and hemoglobin level compared to the control group fed with rice. Hemoglobin level was significantly increased in the groups fed with millets to the extent of 32-37.6%<sup>[56]</sup>. Including ascorbic acid rich fruits in the dinner can enhance uptake of minor millets' non-heme iron<sup>[57]</sup>.

The prevalence of zinc deficiency, contributing to growth retardation, diarrhea, immune deficiency, skin and eye lesions, delayed sexual maturation and behavioral changes (WHO 2000), is very high in South Asia where it varies between 34% and 73%<sup>[58]</sup>. National risk of zinc deficiency in children under 5 years in India is very high<sup>[59]</sup>. One quarter of the total Indian population is at risk of inadequate zinc intake, and therefore it is recognized as a public health problem<sup>[59]</sup>. Including minor millets in their diets might contribute to fulfilling the zinc needs of the Indian people. Finger millets contain more zinc than rice but its bio accessibility is lower<sup>[60]</sup>. Finger millets are rich sources of phytates, which form complexes with zinc, iron and calcium and reduce their bioavailability. However, processing finger millet can reduce the presence of those complexes considerably and enhance the zinc bioavailability<sup>[54]</sup>. Data indicates that food processing procedures such as heat treatment (cooking), fermentation, germination, malting and soaking, as well as treatment with phytase, can improve zinc bioavailability in foods by decreasing the amount of dietary phytate or its lesser phosphorylated derivatives<sup>[23]</sup>

When it comes to vitamins, Table 2 shows that foxtail millet in particular is rich in vitamin B1 (0.59 mg per 100 g). The riboflavin (vitamin B2) content of millets is generally higher than rice, whereas rice and wheat are generally higher in niacin (vitamin B3).

#### **Food products development**

The non-availability of processed products similar to rice or wheat is one of the primary reasons for minor millets' consumption being confined to traditional consumers. In the IFAD-NUS project, novel millet products were developed. The fermentation and germination processes involved in the preparation of some of these products promote starch and protein hydrolysis, and reduced pH and phytates, therefore increasing mineral bioavailability, free sugars and amino acids of products made from finger millet<sup>[54]</sup>. In addition to nutritional quality, other characteristics of the minor millets made them appropriate for food product development. For example, the crispy texture of foxtail millet makes it very suitable for biscuits and fried products. The soft, non-sticky starch consistency of finger millet is very suitable for making 'halwa' and the light, puffy characteristics of little millet are ideal for making fermented ethnic products like 'idli' and 'dosa'. Natural storage stability of some of these products at room temperature was found to be adequate for about two months<sup>[37]</sup>. Through the above methods of preparation, value was added to products avoiding nutritional degradation and the range of palatable dishes was extended. Malleshi<sup>[47]</sup> states that some of the sweet dishes prepared from foxtail millet have superior taste and texture compared to rice. Minor millets can also be used for the preparation of tasty, crispy flakes and noodles with attractive color and good cooking qualities.

The development of the value-added products was targeting particularly women participating in Self-Help Groups, who have been trained on processing, value addition, marketing, packaging,

quality standards, account keeping and entrepreneurship. This capacity building intervention has empowered women in generating more incomes and this dimension is particularly worth highlighting given the conditions of social marginalization experienced by many women in the rural regions of India.

#### **Empowering women as actors of minor millets value chains**

Following is a list of recommendations on how to best pursue the use enhancement of minor millets in India to the benefits of the more vulnerable people, including women. These reflections, some of which of practical nature, have emerged from the IFAD NUS and other relevant projects implemented in so far in India and are referring to key domains of the value chain of minor millets, viz. cultivation, processing, value addition, packaging, distribution, storage, marketing and consumption.

#### **Cultivation**

First of all, promoting small millets demands the farmers be made aware of the financial and environmental benefits of their cultivation. Farmers can also be encouraged to grow millets by enrolling in carbon credit programs that will compensate losses incurred due to longer crop cycles in case they choose to use traditional crops. As seen in the case of Kolli Hills -by linking producers - CBOs (like the "Kolli Hills Agrobiodiversity Conserver's Federation" KHABCOFED, Kolli Hills Agri-bioresource Farmers Producer Company - KAHBPCOL) can capitalize on the growing consumer demand for organic food. At the same time, they could also consider supplying Government's programmes such as the 'Midday Meal Scheme of School Feeding Programme', by substituting other grains with small millets through the public distribution system (PDS) now covering also minor millets. Another important intervention consists in partnering in the diversification of the millet based

foods of the ‘*Integrated Child Development Services*’ (ICDS) in view of the millet prospects resulting from the implementation of the Food Security Act 2013 in each Indian State.

### **Processing**

Processing agricultural produce requires linkages with technical support institutions such as agricultural universities, competitors or other producers and consumers. Some important avenues to explore for supporting use enhancement goals to the benefits of value chain actors esp. women, may include the development of new technologies to minimize waste in de-husking as well as new processes to make use of existing processing waste for possible value-added products; along with continued experimentation with traditional and new recipes through sensorial tests with customers to help improve acceptability of value-added products across different streams of population.

### **Value addition**

Adding value to products requires a clear understanding of the value chain. Such an understanding helps producers cater to different players at higher ends of the value chain. To ensure a successful value chain, quality control mechanism are needed; more research on methods to reduce product contamination is also required along with actions meant to build up consumers’ trust by clearly enumerating product ingredients, lack of preservatives and use of healthy processing methods. Upgrading the capacities of women Self Help Groups and other actors of the value chain is essential and need to be supported. Teaching consumers how to use minor millets by including simple recipe books in the product packages and playing demonstration videos at the point of sale is also another area worth investing efforts on.

### **Packaging**

Packaging is an important aspect of branding. It builds brand identity, and allows consumers to

easily identify products thus building customer loyalty. Ways to do this include: exploring innovative packaging options such as vacuum packing which increases shelf life without using chemicals; provide cooking instructions using simple visuals or including a recipe pamphlet, creating and using attractive corporate identity elements such as a logo and/or a tag-line.

### **Distribution**

An efficient distribution network facilitates the timely and uninterrupted supply of products to retailers and consumers. As supply chains expand, so must the scope and reach out to distribution networks. This activity requires increasing the number of distributors and acquiring a credit line, which will allow producer associations to expand their retailers’ base.

### **Storage**

Storage is an important component of any production process that has reached a critical scale. Farmers require a central storage facility in order to increase millet production and to reap higher margins from seasonal price fluctuations. Producers can access local government programmes for help with storage infrastructure.

### **Marketing**

Minor millets producers, would benefit from a combination of short-term and long-term marketing strategies. Short-term strategies would include: researching different customer segments so that they can market their products in a more targeted manner; developing promotional material like banners and flyers to raise brand visibility; running health awareness campaigns in metros to promote the nutritional benefits of small millets; holding cooking demonstrations at food courts and corporate canteens to reach an urban audience; establishing linkages to hotel chains, eateries, schools or educational institutions with eco-friendly philosophies; Mid- to long-term strategies would involve: establishing an online shopping portal to sell natural or organic products; dispelling

myths about millets to better promote the brand; disseminating information about the benefits and appeal of millet-based products in schools

### Consumption

Millets-based cooking demonstrations, *Food Mela*, Food Diversity Fairs in production points and User Points are among the most useful practices that can be supported by the National Nutrition Mission of the States in India in which women -as ambassadors of the nutritional and healthy benefits of millets- would play a key role. Their role would be also particularly significant when targeting children, adolescent girls and aged people.

### Conclusions

The economic conditions of a vast majority of India's population is so poor that they are in no position to afford even the least expensive balanced diets <sup>[5]</sup>. It is important to remember that most smallholder farmers, including those in the subcontinent, are net food buyers. Increasing disposable income is therefore an essential avenue for better nutrition. The lessons learnt through the IFAD NUS international research effort demonstrate that currently marginalized crops, such as minor millets, can in fact contribute to a more affordable nutrition security of the Indian rural and urban poor while also being a valid instrument of economic development as well as of empowerment of women and the vulnerable and marginalized groups of the society. In order for this to occur, interventions are needed in a number of critical domains which we have listed as follows:

**1) More research efforts:** work is needed to better link agriculture with nutrition and health through the use of nutrition-rich traditional crops. The case of minor millets presented here is in fact just an emblematic case. India is endowed with hundreds of nutritious crops (pulses, fruits, vegetables etc.), whose R&D is still poorly addressed. Although there is an interesting literature compiling these

resources and describing their agro-morphological traits, more is needed to validate nutrition and health claims supported by indigenous knowledge.

**2) Resilient systems:** minor millets are strategic in strengthening the resilience of local production systems, buffering against climate change but also fluctuations of commodity food prices that may dramatically hit the poor. Governments need to be sensitized to this and be requested to urgently develop supportive policies on resilient crops for resilient production and food systems.

**3) Food policies:** The approved Food Security Act of India including minor millets in the PDS is an excellent move for more resilient production and food systems. However, many other steps are needed to allow its implementation in each State - like Odisha and Karnataka (such as promoting their use through inclusion in the Public Distribution Systems, education and sensitization of public opinion on the value of biodiversity for nutritious and healthier diets and securing adequate supply of millet flour to meet increasing demands).

**4) Consistent value chain interventions:** as we move forward to broaden the use of traditional crops such as minor millets, we are confronted with a number of shortcomings that affect their value chain which need consistent interventions through holistic value chain approaches <sup>[61]</sup>. Examples of bottle necks to be addressed include lack of improved varieties and best cultivation practices, poor harvest and post-harvest technology, disorganized markets, limited participation of private sector, poor microcredit support and horizontal and vertical integration along the value chain <sup>[62]</sup>.

**5) Mainstreaming:** the financial assistance of international agencies such as Swiss Agency for Development and Cooperation (SDC), International Fund for Agriculture and Development (IFAD), the International Development Research Center (IDRC) Canada or the Canadian International Development



Agency (CIDA), Food and Agricultural Organization (FAO) who had been championing the support for enhancing the sustainable conservation and use of NUS at the global level, is most strategic and much appreciated. But in order to achieve a larger and long lasting impact of these nutritious crops on the lives of people, the role of policy makers in supporting the mainstreaming of best practices developed in so far into Governments' actions is most crucial and emphasized in the Global Manifesto on Forgotten Crops (GFAR 2021).

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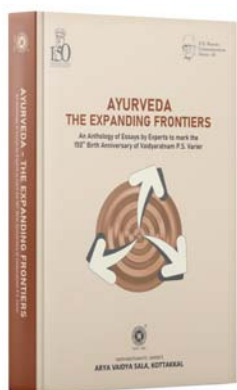
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## Potential implications of *ayurveda* in the management of lichen amyloidosis: A clinical case study

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**ABSTRACT:** The skin is the largest organ in our body. The skin acts as a barrier from physical, chemical, biological toxins and also maintains body temperature. Skin diseases fall under a group of disorders which are more prevalent in general practice. Lichen amyloidosis is the most common form of primary localized cutaneous amyloidosis. The cause is unknown, but the condition is thought to be induced by scratching. It is presented mostly in the 5th or 6th decade of life. *Kushtha* is the general terminology to describe skin diseases in *ayurveda*. According to *ayurveda*, change in lifestyle plays a major role in the manifestation of *kushtha*. Also, *kushtha* is considered as a *Mahaaroga*, as *sapta-dhaatus* are involved in the pathogenesis of *kushtha*. Repeated *sodhana-karma* is advocated in the management of *kushtha*. And *samana-cikitsa* also plays a significant role in *alpa-dosha-harana*. This paper highlights a case study of *kitibhakushtha* treated with classic ayurvedic principles focused mainly on *snehapaana* and *sodhana*. By doing treatments based on these principles this patient got considerable relief.

**Key words:** Lichen amyloidosis, *Kitibha kushtha*, *sodhana*

### Introduction

Skin is the integumentary tissue covers our body composed of seven *dhatu*s. *Ayurveda* says “*Dosha dhaatu mala moolam hi sareeram*”<sup>[1]</sup>. Any derangement in the functioning of *dosha*, *dhaatu* and *mala* leads to diseases *vakshyante raktadoshajaa*, which means vitiation of *rakta-dhaatu* leads to *kushtha/tvak-vikaaras*<sup>[2]</sup>. *Nidaana* like *mithyaahaara-vihaara* and *maanasika bhava* vitiates *tridosha*, that further leads to the affliction and aggravation of *rasa*, *rakta*, *maamsa* and *laseekaa*<sup>[3]</sup>. Each *dosha* vitiation elicits the different *lakshanas* in the *tvak*. According to Caraka *Acaarya*, *kitibha kushtha* is one of the *rakta-pradoshaja vikaaras* caused by the vitiation of *vaata* and *kaphadosha* in excess, having features like *gyaava varna* (blackish brown colour), *kina-*

*khara-sparsa* (rough like callus), *parusha* (dryness), *rooksha-pidakaa* (skin eruption) and *kandu* (itching)<sup>[4]</sup>. The main line of treatment of *kushtha* is repeated *sodhana*. The *doshas* which are pacified by *sodhana* never re-occur. *Virecana* is the *sodhana karma* for *raktaja-vikaara* to eliminate *doshas* from their root<sup>[5]</sup>.

Plaque lichen amyloidosis is the most common form of primary localized cutaneous amyloidosis. Lichen amyloidosis typically presents as multiple pruritic, firm, hyper pigmented, hyper keratotic papules on the shins that later give the appearance of a rippled pattern. Over time, the papules become thickened plaques which are very difficult to get cured. Hence it, is the need of an hour to search effective, adequate and safe ideal remedy from *ayurveda* to cure the disease from its root.

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## Patient information

### Case report

A 60-year-old male patient, working in Merchant navy as a Chief engineer, came to the OPD of Department of Kayachikitsa, Govt. Ayurveda College, Thripunithura. His presenting complaints, were blackish, thickened, itchy dry skin lesions predominantly over the bilateral lower limb, the shin, the arms and the lower back region aggravated for about 3 years.

At the age of 20, he noticed a thickened, irregular bordered, blackish discoloration on his right thumb, and some black moles beneath the thumb. He consulted a dermatologist in Ernakulam and took oral medication. But after taking those medicines, he had sudden hair loss. So, he stopped the medication and consulted a traditional ayurvedic doctor near his residence. He responded well to the treatment and hence continued the treatment for almost 5 years and he got complete relief for his complaints.

At the age of 34, he suddenly developed blackish discoloration throughout the whole face, except nose and bilateral lower limbs. He consulted an ayurvedic physician and took medication. Symptoms got relieved in 2 years but blackish discoloration persisted over his legs. Then he went for job in merchant navy, On account of his lifestyle blackish discoloration reappeared. He also noticed that every time when he came back home for leave, he gets affected with fever and cold, followed by papules over both shin, arms and low back region. Scratching was very irresistible. Presently there are itchy thickened blackish skin over both the hands. He took OP medicines and got considerable relief, because of which he came here for better management.

### History of past illness

- No H/O T2DM/ HTN/ DLP / Thyroid dysfunction.

- H/O Asthma at the age of 3 years
- H/O Jaundice at the age of 5 years

### Family history

- Father had History of Asthma.
- Mother had H/O itchy skin lesions below knee
- Brother developed some skin problems recently.
- Son has asthma complaints.

### Personal history

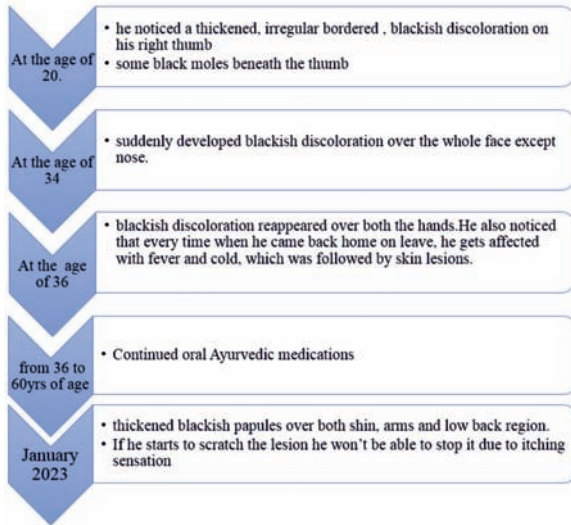
- Diet-Foods that are reheated and frozen are consumed more often.
- Bowel: regular, once per day [occasionally hard stools]
- Appetite: good
- Micturition: within normal limits
- Sleep: sound
- Allergies: dust allergy [sneezing, breathing difficulty]
- Habits: nil
- Addictions: nil

### Clinical finding

- Integumentary system examination
- Morphology:
  - Type of lesion: hyper pigmented, hyper keratotic papule
  - Site of lesion: bilateral shin and lower limb, low back regions, both the arms and fore-arms.
  - Number: numerous
  - Shape: circular
  - Colour: black, grey
  - Distribution: asymmetric
  - Itching: +++
  - Scaling: - Absent
  - Associated complaints:
    - Hair: normal
    - Nail: normal



### Time Line



### Nidana

Analysing the *nidaana* showed that there was intermittent use *seeta* and *ushna* both in *aahaara* and *vihaara*. *Akaala sayana* and *ratri jaagarana* were also noted. All these can be the causes of vitiation of *rakta-dhatu*.

Nidaana seva → Agni vyaapaara-vikrti → Anna vaha-sroto-dushti → Tridosha

*Rasa, rakta, maamsa, lasikaa* → *vikrtirasa-maarga-avarodha in tvak* → *Pidakaa* with *kandu, daaha*, in *sarvaanga* → *Kitibha-kushtha*.

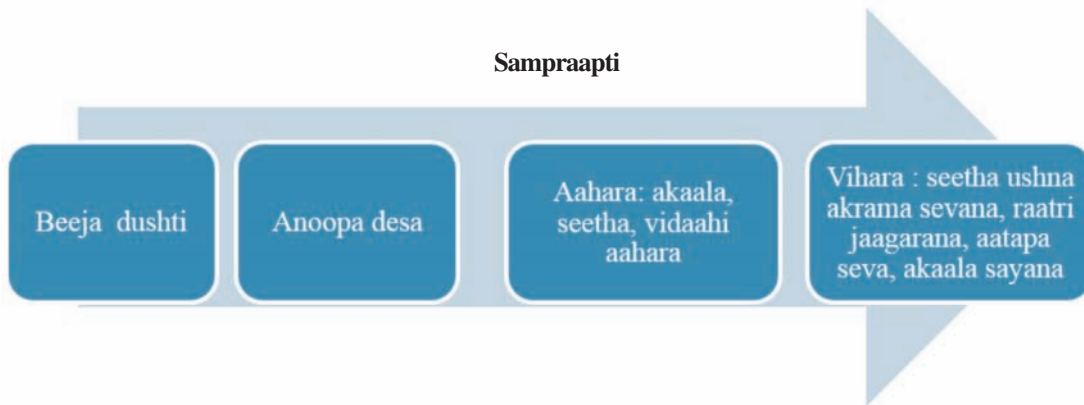


Figure 1

Skin lesions of both legs at the time of admission



Involvement of *tridosha* is *vaatapradhana-kaphamadhya-pittaheena-dushti*.

### Diagnostic assessment

#### Diagnostic methods

#### Physical examinations

Blackish hyper pigmented, hyper keratotic papule over bilateral shin and lower limb, low back, both the arms and the forearms.

#### Laboratory testing

Blood investigation [18-01-2023]

Hb – 13.4mg/dl

Absolute eosinophil count: 980 cell/microlitre

Figure 2  
Skin lesions of both upper limbs at the time of admission



### Diagnostic challenges

Since the patient is a 60-year-old male, presented rough, blackish hyper pigmented hyper keratotic plaques and which are numerous in number. Lichen amyloidosis is typically present in the 5<sup>th</sup> or 6<sup>th</sup> decade of life, and more common in men and in people with darker phenotypes. Lichen amyloidosis typically presents as multiple, pruritic, hard, hyper- pigmented, hyper keratotic papules on shins mainly. So reached to the diagnosis of lichen amyloidosis.

These papules have a *kinakhara-sparsa*, *asita*[black] and *parusha* [rough] in nature. Found *doshaadhikya* as *vaatakapha*. Made diagnosis of *kitibha-kushtha*. Also, because this

patient is working in the merchant navy, he is constantly exposed to the sea breeze, which dries out his skin and body.

### Differential diagnosis

#### Ayurveda

- *Carma kushtha*
- *Eka kushtha*
- *Sidhma kushtha*

#### Modern: Lichen planus

- Prurigo nodularis

### Prognostic characteristics

Since it is chronic in nature, along with continuous exposure to *nidaanas* it is not completely curable. But can be manageable. Strong family history of asthma and skin lesions running in the family is also a risk factor for bad prognosis.

### Therapeutic intervention

#### Treatment adopted

- *Aama paacana*
- *Aarohana-snehapaana*
- *Virecana*
- *Baahya-prayoga*
- *Samanoushadhi*
- *Pathyaapathya*

*Snehapaana* was done for seven days from the initial dosage, 25 ml increasing slightly everyday upto 130 ml on the final day with the intermittent doses of 35, 50, 80.90 and 110 mls.

Table 1  
Internal medication

Date	No	Name of medicine	Dose of medicine and time of administration	Remarks
17-01-2023	1	Guluchyadi Kashaya <sup>[6]</sup>	90ml BD Before food	Digestion corrected
	2	Aragwadharishtam	25ml two times a day after food	
	3	Shaddharanam gulika <sup>[7]</sup>	1-0-1 with <i>Kashaya</i>	
24-01-2023	1	<i>Snehapana</i> with DasamoolaAmruthaadi taila <sup>[8]</sup>	<i>Aarohanamaatra</i>	Hyperpigmentation reduced. Skin became softened
4-02-2023	1	Manibhadragula <sup>[9]</sup> along with <i>garkara</i>	20g	19 <i>vegas</i>



Table 2 <i>Baahya-cikitsa</i>				
Date	No	Name of procedure	Duration of procedure	Remarks
2-2-23	1	<i>Abhyanga</i> with Guggulumarichadi tailam <sup>[10]</sup> along with <i>potalisweda</i> with siddharthakaa snana churna <sup>[11]</sup>	3 days	Skin becomes softer
11-2-23	2	<i>Takradhaara</i> with Kashaya of <i>Aamalaki</i> + <i>Aaragwadha</i>	7 days	Hardness reduced

### Follow-up and outcome

After *snehapaana*

Figure 3

Changes in the skin lesions of both legs after *Snehapaana*



Figure 5  
Changes in both the legs



Figure 6  
Changes in the upper limb at the time of discharge

During *potali sweda*

Figure 4

Changes in both the arms



Figure 7  
Changes in the lower limb at the time of discharge



**At the time of discharge**

At the time of discharge, the roughness and thickness of the low back region were reduced by 80%. Roughness and itchy papules on the bilateral arms got reduced. Normal skin can be visible between the blackish rough skin over the bilateral lower limbs. The severity of itching also got reduced.

**Result and discussion**

In ayurvedic classics skin diseases are mentioned under the context of *kushtha*, *visarpa*, and *kshudraroga*. *Kushtha* is considered as a *mahaaroga* by *Ayurveda Acaaryas*. And also, *kushtha* is explained as *deergharogas*. But a wide variety of treatment applications is told by

Figure 8  
Before & After Treatment changes

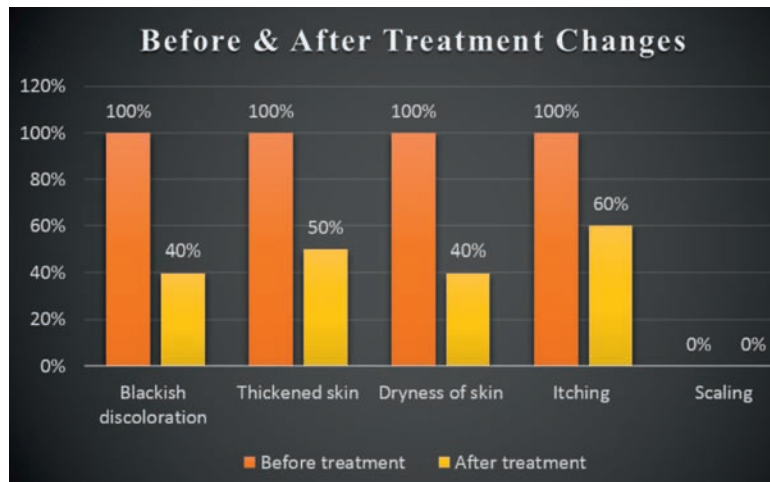
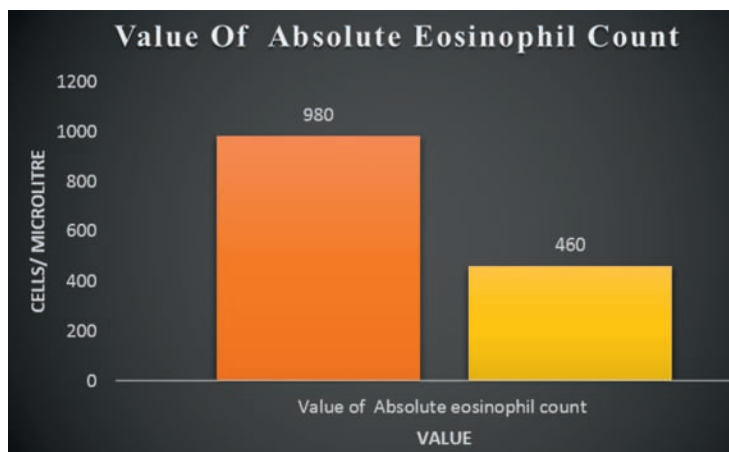


Figure 9  
Value of Eosinophil Count before & After the Treatment



*Aacaaryas* for the management of *kushtha*. This case was diagnosed as *Kitibha-kushtha*, which is *vaata-kapha* predominant<sup>[12]</sup>. On history taking patient had irregular dietary pattern including untimely food intake, use of refrigerated food, reheated food, *guru and viruddhaahara*. *Vihaara* such as *seetoshna-akrama-sevana and raatri-jaagarana*. Along with this he had a strong family history of skin diseases and asthma. Theses *nidanas* caused *agnidushti*. That further leads to *tridosha-vikrti* along with vitiation of *rasa, rakta, mamsa and laseeka*. *Vikrta rasa* caused *maagaavarodha* in *tvak* manifested as *pidakaa* with *kandu* in the lower limbs, low back region and arms. In the beginning the patient was given Guloochyadi Kashaya and Shaddharanam tablets for *aamapaacana*. Aragwadharishta was also given in the first phase since *arishta* is prepared by *paaka* and it is definitely having a *paacana svabhaava*. (Table 1).

Then he was administered with *snehapaana* along with Dasamoola Amruthaditaila, mentioned in *Ashtanga hrdaya Ciikitsaa-sthaanam*. Since the disease is *vaata-kapha* predominant, *taila* was selected for *snehapaana*. The ingredients of Dasamoolaamruthadi taila are also *vaatakapha-hara*. After 7 days of *snehapaana* itself, the itching and the discoloration reduced. Since the skin lesions were more pronounced on *adhobhaaga*, *virecana* was done, Manibahadragula was selected for *virecana*. With 19 *vegas madhyama samyakyoga* was obtained. To prevent *vaataprakopa* after *virecana* we had given *peyaadi-krama* as per *madhyamasuddhi*, along with one teaspoon *ghee*. After *virecana* Guggulumarichadi taila was given for *abhyanga* which is also told in the context of *kushtha-cikitsa*. *Guggulu* is *vaatakapha-hara* in nature, and *marichaadi* has *teekshnaguna* also.

Normally *sweda* is contra indicated in *kushtha*, but for reducing the *khara-bhaava* of skin, we applied *potali sweda* with Sidhaarthaka snaana

*choorna*. Embryologically, neurons and epidermis are originated from ectoderm. The concept of skin brain axis further substantiates the role of stress in aggravating skin diseases and vice versa. Considering this we did 5 days *sira-takradhaara* followed by full body *takradhaara* with *aaragwadha* and *aamalaka*. (Table 2) Since the disease has *cirakalanu bandhatvam* it is difficult to get complete cure.

On discharge, he was advised to include fresh fruits and vegetables like *patola, aamalaka, koosmanda* in his diet as it improves the skin softness. Also advised not to take reheated as well as refrigerated food. He was also educated to avoid deep fried foods, baked items, spicy foods and pickles, and improper sleep pattern as well. Patient was advised to take Mahatikthakam ghritham 10g at bed time and to do *abhyanga* with Eladi tailam.

**Strength of this treatment modality:** By the IP management, stress of the patient was reduced, and as a result there was reduction in symptoms also.

**Weakness of this treatment modality:** Since the patient had less leave for treatment, we could not give him *rasaayana* medication.

**Primary take away lesson:** In modern as well as ayurvedic perspective, skin diseases and lifestyle of the patient is very much interrelated. But through ayurvedic management it is possible to cure.

#### **Patient perspective**

Patient got subjective relief in the symptoms and was happy and satisfied at the time of discharge.

#### **Acknowledgement**

We thank Professor Murali, (Retd. Professor and HOD, Department of Kayachikitsa, Government Ayurveda College Tripunithura, Kerala) for his guidance.



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### Clinical Application of Dosha Assessment

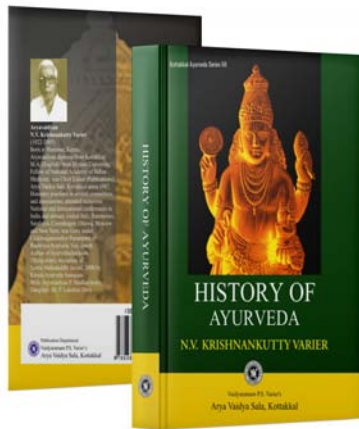
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A deep knowledge regarding features of *sama avastha* and *vishama avastha* is mandatory. When *dosha* analysis is scientifically done during each steps of decision making as well as treatment, *cikitsa* becomes more target oriented, less time consuming, cost effective. It also makes the clinical experience presentable to a scientific world.

## “HISTORY OF AYURVEDA” : A text on scientific disclose of the evolution of *ayurveda*

Vyshna Ravindran<sup>1</sup>, Binitha A.<sup>2</sup>, Jigeesh P.P.<sup>3</sup>



### Introduction

According to Edmund Burke’s famous dictum, ‘Those who do not know history are doomed to repeat it’, history holds importance because it will help us getting a comprehensive idea of the past and can potentially serve as a template for the future. From this perspective, the history of medicine is intriguing. Ayurvedic science, an ancient Indian medical tradition, weaves mysticism and veils of divinity throughout its historical facets. The need for such glorification was to render it socially permissible and not meant to dissuade the inquisitive nature. Separating the history from the mythical narratives within the context of the societal framework will give us a clear picture of its evolution. Such an attempt is made through the book “*History of Ayurveda*”. It is authored by N.V Krishnankutty Varier and published by Arya Vaidya Sala, Kottakkal. The

first edition of the book which contains 369 pages, is priced at Rs 160.

The author, NVK Varier was born in the 20<sup>th</sup> century, during the time when there was a resurgence of interest in *ayurveda* and a demand for a scientific justification for the practice. He received an Aryavaidyan diploma from Kottakkal as well as an M.A. in English from Mysore University and was also a Fellow of the National Academy of Indian Medicine. He published a book , *Ayurvedacaritram* in Malayalam in the year 1980, which was later translated to English and restructured into the present form in the year 2005.

### Contents

Introduction to this book was given by the famous historian, Dr. MGS Narayanan as it was the first effort on this field of ayurveda from the Southern part of the country. The book is divided into 6 sections. Section 1 titled “Primitive age” contains 4 chapters in which the author writes about the origin of *ayurveda*, classical texts in *ayurveda*, *ayurveda* through ages, and about Gods & sages respectively. He begins by describing the mystical references to the origin of *ayurveda* mentioned in each of the *Samhita*. Later he demystifies these stories and tries to give concreteness to these concepts. For example, while talking about Brahma, Varier states that it is a figurative statement pointing to the fact that it took shape at

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the dawn of human life. He then continues to describe the evolution of medicine through the Vedic times – the journey from the primitive knowledge in the earlier phase to a more systematic approach during the times of *samhitas*. He highlights the fact that the *samhitas* are relatively free of tantric practices and are based on the principles of *darsana*. Parallely, he also mentions the medical developments of the Indus valley civilization from where the tantric sciences are believed to be developed. The influence of vedic and tantric streams of Indian thoughts on the medical system is described in the further chapters.

Section 2 titled “Age of codification” discusses the contents of different *samhitas* in 7 chapters. One chapter is exclusively devoted to *ayurveda* in the Buddhist era. He mentions that though there is evidence to conclude that *ayurveda* had spread to other countries from very early times, it was during the Buddhist era that *ayurveda* reached its zenith glory. The spread of *ayurveda* to different regions including China and Southeast Asian countries along with Asoka’s propagation of Buddhism is detailed in this section. The chapter concludes with a discussion of how later civil wars and internal crises led to *ayurveda*’s decline; a discipline that had been vibrant until then had become a frozen tradition.

The 3rd Section titled “Different branches” contains 4 chapters and details the various historical evolution of different branches of science such as obstetrics, paediatrics, demonology, alchemy and a few other works. He highlights the fact that though alchemy is believed to be a relatively new science, evidence shows that *kanmada* (*Śilajit*) and other minerals found in Mohanjo Daro and Indus valley civilization were believed to be collected and preserved for medicinal use.

Section 4 titled “Therapies for plants and animals” contains 3 chapters that talk about *asvayurveda*,

*hastyayurveda*, and *vrkshayurveda*. Veterinary sciences and horticulture in ancient India are discussed in much detail. Contents of *Saalihotram* – a text on *asvayurveda* and *Paalakaapyam* – an elaborate work on elephants are summarized here. The section on *vrkshayurveda* contains details on *kunapajala* – artificial liquid manure, methods to produce seedless fruit and other practices of ancient agriculture.

Section 5 titled “Comparative study” talks about the similarities of ancient systems of therapy in 3 chapters. For example in the chapters he mentions that India and Modern-day Iran seemed to have similar practices of medicine. In fact, references of Kankayana, the physician from Bahlika (i.e) modern-day Iran and northern Afghanistan in ayurvedic texts shows that the medical practices prevalent in Bahlika have influenced *ayurveda* and the other way around. He mentions references to such similarities between the medical systems that existed in ancient Egypt, Rome, Greece, China and others. He tries to paint a picture of how boundaries were no barrier to the spread of knowledge and traditions through these chapters.

Section 6 talks about ayurvedic education. In 4 chapters he describes ayurvedic education up to the 18th century, education in the modern era, *ayurveda* in Kerala, and the past 100 years of ayurvedic education respectively.

### **Analysis**

A timely compilation of works on history can make us better prepared for the future. Compilation on history of *ayurveda* is successfully attempted by many authors. This particular book on ayurvedic history becomes one of a kind because of the approach it takes in making a scientific disclosure of the glorious history. For example, the author says that the symposium at the foothills of the Himalayas might even be a dramatic description adopted to bring out the diverse opinions. The

book talks not just about the evolution of *ayurveda* in India but also takes a global perspective in understanding the evolution of medical systems. The influence of the various traditional systems of medicine and similarities between them are discussed in much detail which makes this work a unique contribution.

The text has managed to interpret the facts of medical science in its relation to social evolution. The history of any system cannot be studied in isolation. Its relevance with respect to the social and cultural norms is what makes it significant. This text has managed to tie these two together beautifully. For example, the veils of divinity and perfection in the medical systems were used initially to bestow faith among the people. Greek medicine, the origin of allopathy too had used these veils in the beginning. But with the golden age of the Greek medical system which is associated with the age of Hippocrates, these veils were broken to bring out the science from the cult. A similar trend of evolution was observed in India during the time of *samhitas*.

The author also attempts to resolve conflicts throughout the work, beginning with the disagreement surrounding the time of composition of the *Caraka samhita* and *Susruta samhita*. The author puts forward that though the teachings of *Caraka samhita* were conceived much earlier, the book only took shape after the era of *Susruta samhita*.

Another highlight of the book is how it has comprehensively incorporated the evolution of veterinary sciences and horticulture in India. The preparation of *kunapajalam* is mentioned here, in which portions of animals carcasses having plenty of marrow, fat and lard are taken, mixed together and boiled in water. To these, powders of sesame seeds and black gram are added, and then mixed with milk, honey and hot water. This mixture is then exposed to the sun for a fortnight.

This liquid manure is said to enable mushroom growth of the plants. Somewhere in the timeline of evolution, *ayurveda* for humans managed to take the centre stage. Now again, with the advent of much attention on the concepts of one health, *ayurveda* for animals and plants is gaining popularity. At such a stage, texts like *Salihotram* and *Paalakaapyam* would gain much relevance.

It is a user-friendly work because of the order in which the texts unfold the easy language it employs, and its comprehensiveness. The scientific disclosure that the book aims to make will undoubtedly elicit a spirit of inquiry in all of its readers.

Though the chapter on the history of *ayurveda* in Kerala falls short of capturing the depth and breadth of the science in Kerala, it does trigger the necessity to explore *ayurveda*'s evolution by region. The chapter also outlines the importance to explore the influence of *ayurveda* on local health practices and the other way around. The inclusion of a history of the evolution of *ayurveda* in various regions of India would have made the text more thorough. For the upcoming edition, these considerations might be taken into account.

### Conclusion

The history of medicine is a fascinating subject. Studying history is not to glorify the past but to help us guide the future. As civilization evolves, disease patterns change and so do the medical systems. A timely compilation of such works on history will help us in getting a comprehensive idea of the past and can potentially serve as a template for the future. The history of *ayurveda* shouldn't be a mere compilation of mysticism and divinity but the actual evolution of the science in the background of the social structure in a global framework. *History of ayurveda* by NVK Varier embodies this very spirit and thus becomes a must-read for every ayurvedic student.



# Streekalute vyaayamam (Exercises for women)

Madhaviyamma P.

Dhanvantari is the first medical journal in Malayalam published every month by Vaidyaratnam P. S. Varier from Arya Vaidya Sala uninterruptedly for 23 years from 1903 to 1926. This clinical note was published in its column on Book No. 3, 1081 (Malayalam Era) kumbham (Malayalam Month) 1909 (CE) Issue, Article No. 7, Page 131.



1. Intake of more oxygen
2. Faster and even blood flow
3. Vitality and strength for the vital organs
4. Proper excretion without any discomfort

Since the weaker women, especially that of Kerala, often find the regimen hard, a mind storming is imperative to tackle it. The following are some of the protocols tailor made for the Malayali womenfolk omitting the expensive ones. Most of the housekeeping chores that the women undertake or are bound to undertake as per the societal norms, are forms of natural exercise protocols by themselves. Brooming the floor, dusting the curios, spreading the sheets, drawing water from the well and others provide all the necessary movements for the muscles in the body and bless them with strength and proper structure. They wouldn't find it arduous nor a waste of time but would rather feel a sense of gratitude which in turn would add enthusiasm to the said chores.

Exercise is as inevitable as food, water and others for mankind. Those who crave for well being are bound to obey the physical regimen. The women, who are to care for the young ones and the household, should adhere to it even more than the men. The following are some of the salient factors of physical exercises.

It doesn't mean that they have to tire themselves out by lifting heavy objects or other such strenuous ones. When they are tired, they have to take rest. It is ludicrous to think that the time taken for the rest is a waste of time. In fact, the rest provides them with the zest which rubs over the tasks ahead and makes it easier to accomplish them. Efforts on the contrary will result in failure. Mindfulness



in certain things will make sure that the chores won't be tiresome. Properly ventilated rooms happen to be the best way to beat fatigue.

Since it is one of the common pointers of faith and belief in God, conducting *Pradakshina* (circumvilation) after sunset in the nearby temple is also an excellent protocol to follow. Farming in lands and fields is yet another protocol. It is to be noted that those who indulge in such activities have a beautiful structure and allure when compared with the elite class of women who usher the servants to provide the water to wash their hands. The latter crib from fatigue and waste their bodies and lives to be a burden to their husbands and children. All I can do is let them be jealous of the zest and beauty of their sisters, those who work the fields.

There are numerous protocols that the women can do in their own rooms, especially for those who are in the postpartum phase. These provide stability for the entire body, particularly the abdomen and bless them with proper functioning. The protocols are as follows:

1. Lie supine, with or without a pillow, and lift the head as far as possible and bring it back to the resting position. Deep breaths are to be taken once the head is lowered. Repeat the process until weakness is on the horizon.

2. Lie supine and bend the right knee and bring it parallel to the body, hold and return it to the original position. Repeat the same with the left. The

process is to be continued until fatigue is on the horizon.

3. Lie supine, lift the legs and bring it parallel to the body and slowly return them to its original position. This protocol is a bit difficult hence should only be practised after gaining enough strength with the first two protocols.

Prescribed timings are in the mornings, after bathroom chores and nights, before the dinner. Do mind not to tire yourself out. Once the strength is gained, the pace of the protocols is to be increased. The list is endless and to explain every one of them will extend the length of the piece.

The dress code should also be ideal. Tight blouse and saree invariably shorten the breath and hence fatigue sets in rather quickly. Therefore attires that are loose and help the movement of the body are prescribed.

The protocols tailor-made for the abdomen are all recommendable for the women. Since it's not that time consuming, they can be practised twice daily for 15 or 20 minutes. Adherence to the regime without fail, bless the pregnant woman with the strength equivalent to that of a man. Specific timings are necessary for everything, especially for exercise. The latter without will reap only half the benefits.

Apart from providing appropriate strength to the muscles, the protocols help in proper bowel movements as well. It is a given fact that proper excretion results in well-being.

# OBITUARY



**Prof. R.H.Singh**  
(1942-2023)

With the demise of Prof. R.H. Singh world has lost a scholar and proponent of *ayurveda*. He has contributed substantially to education, research, literature and clinical practice of Indian medical knowledge system.

Ram Harsh Singh born on 10 January 1942 in Kaniyari pur village of Mau district in the Indian state of Uttar Pradesh, India. After graduating from Banaras Hindu University (BHU) in Ayurveda Medicine and Surgery (ABMS) in 1961, R. H. Singh served as a faculty member, later to hold various positions at his alma mater. He was fortunate to have the guide for doctoral degree (PhD) K. N. Udupa, (a pioneer in integrative medicine and also the founder director of the Institute of Medical Sciences at BHU). Even after retirement his services were available as Emeritus Professor. When Government of Rajasthan established Ayurveda University, he was invited to serve it as Vice Chancellor. He was also instrumental in propagating ayurveda abroad, as the visiting Professor at College of Ayurveda of Mount Madonna Institute, USA.

Dr. R.H. Singh contributed significantly to ayurvedic literature. He had authored nearly twelve books which include 'The Holistic Principles of Ayurvedic Medicine', 'Body Mind Spirit: Integrative Medicine in Ayurveda' and 'Yoga and Nature Cure'. He has published more than 200 research papers in Indian and international journals indicating the keen interest in developing Ayurveda on scientific lines as an evidence-based system of medicine.

Dr. Singh was a member of several academic policy making bodies like scientific advisory board of Central Council for Research in Ayurvedic Sciences, National Commission on History of Science etc. He founded Association of Ayurvedic Physicians of India.

This eminent academician was conferred with Padmashree by the Government of India in 2016. Mahatma Gandhi Institute of Medical Sciences honored him with a Lifetime achievement Award in 2007.

Dr. R.H.Singh had not visited Kerala frequently. But Kerala and its ayurvedic tradition attracted him as an academician. In the book 'Pancha Karma Therapy: Ancient Classical Concepts, Traditional Practices' Dr. Singh specifically highlights the Kerala therapies. It is also noteworthy that this book is dedicated to the ancient physicians of Kerala for keeping the tradition of panchakarma alive. Aryavaidyan Journal was fortunate to have him as a member of its National Advisory Borad since 2016. He was very keen about the highest qualities to be maintained by a scientific journal. It is by following his suggestions that we could achieve the standards.

Our humble pranams to the departed soul.

## OBITUARY



**Dr. P.K. Mohanlal**  
(1945-2023)

Kerala lost an eminent physician and author with the passing away of Dr.P.K.Mohanlal.

Born in a family of ayurvedic physicians, Dr. Mohanlal had his graduation from Government Ayurveda College, Thiruvananthapuram. He underwent an informal training with his learned father Ayurvedacharya K.Kunjiraman Vaidyar (Founder of Pourasthya Pharmacy, Perinadu, Kollam District) for a period of time. Later Mohanlal did his post graduation in marmachikitsa from Government Ayurveda College, Thiruvananthapuram. Immediately after the course he could serve the alma mater as a teacher which was continued in all the Government Ayurveda Colleges of Kerala for more than thirty years. Subsequently he held the positions Medical Superintendent, Professor and Principal. As the Principal newly initiated Government Ayurveda College at Kannur, he was instrumental in developing to higher standards. When the State Government established a separate Directorate for Ayurvedic Medical Education in 2001, he was selected for the post.

Dr.Mohanlal was member many academic bodies at both State and National level. All the Universities in Kerala had him as a member in the Board of Studies. This eloquent teacher was a member in Central Council of Indian Medicine and the Governing Body of National Institute of Ayurveda, Jaipur.

Dr. P.K. Mohanlal was a reputed author in Malayalam. *Chila Chikitsannubhavangal* is a collection of his clinical experiences. *Ayurvedathinte samagraveekshanam* contains articles on the basic principles of *ayurveda*. *Keralathile Ayurveda Vidyabhyasam* is the documentation of the genesis and development of ayurvedic education in Kerala.

He was recognized for his services to *ayurveda* by the authorities and different organisations. Dhanvanthari Award by Government of Kerala for the best *ayurveda* doctor was conferred in 2008. From Ayurveda Medical Association of India he received Bhisagratna award in 2009. He was also honoured by Sree Sankara Sanskrit University, Kalady in 2019 for his contributions to *ayurveda*.

With our beloved former Managing Trustee, Dr. P.K Warrior and the founder Chief Editor Dr. N.V.K. Varier, he had an intimate relationship. Dr. P.K.Mohanlal was keen in actively participating the annual seminars of Arya Vaidya Sala. In 1995's seminar, presented the theme paper 'Jwarachikitsa- a revalidation'

Dr. Mohanlal was in the Advisory Board of Aryavaidyan since 2016 and provided us valid suggestions to make the journal better. We pay homage to departed soul.

## INSTRUCTIONS TO AUTHORS

Author: Those who have substantially contributed to the reported work is to be considered as author. Corresponding author is responsible for all the communication with the journal. Non author contributors may be acknowledged in the relevant portion of the paper.

### Manuscripts Submission

Submission can be in form of original research articles, review articles, short communications, case studies and book reviews. All submissions should be made through email: [publications@aryavaidyasala.com](mailto:publications@aryavaidyasala.com).

The language of the journal is English. For Devanagari script please follow the transliteration key given and make them in Italics.

### Transliteration Index

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a	aa	i	ee	u	oo	r	e	ai	o	au	am	ah		
क	ख	ग	घ	ङ	च	छ	ज	झ	ञ					
k	kh	g	gh	ng	c	ch	j	jh	nj					
ट	ठ	ड	ढ	ण	त	थ	द	ध	न					
t	th	d	dh	n	t	th	d	dh	n					
प	फ	ब	भ	म	य	र	ल	व	श	ष	स	ह	ळ	क्ष
p	ph	b	bh	m	y	r	l	v	s	sh	s	h	l	ksh
क	का	कि	की	कु	कू	कृ	के	कै	को	कौ	कं	कः		
ka	kaa	ki	kee	ku	koo	kr	ke	kai	ko	kau	kam	kah		

Manuscripts submitted will undergo internal editorial review and external peer reviewing.

Kindly go through the details below before submitting the article.

### Manuscript presentation

Article must be clear in delivering the idea. It should be devoid of any grammatical mistakes. Ayurvedic and Sanskrit terms must be in italics. Manuscripts must be typed double spaced with margins of one inch (2.5cm) at the top, bottom and the sides and all pages numbered starting from the title page. 12 pt Times New Roman font must be used and remain uniform throughout the text.

There is no need of translating the fundamental words of Ayurveda in English. Eg. *Dosha*-Humors, *Agni*- Bio fire, etc. Use the transliteration key given, for writing Sanskrit words.

Research articles, review articles and short communications must be limited to 5000, 4000 and 2000 words in length respectively.

Structure of the manuscript is presented below.

**(i) Title page:** This page should contain title of the article with affiliation and addresses of all the authors, including corresponding author with an asterisk. E-mail ID of the corresponding author should be provided as a foot note on the title page.

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**(v) Introduction:** Objectives of the investigation with enough background of the subject must be stated in the introduction. The significance of the work in relation to the earlier ones has to be explained with relevant references. Introduction can be concluded with the aims and objectives of the study.

**(vi) Materials and methods:** All the materials that have been used to conduct a study along with the procedures adapted has to be included in detail. Adequate details of the methodology (study design) of the work should be provided so that others can reproduce it. Previously reported methods can also be cited with proper references. Modifications done to it has to be described. It is in this section, that ethical approval, study period, sample size, grouping, evaluation criteria, exclusion criteria and statistical methods should also be described in sequential manner.

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Losses to observation (such as, dropouts from a clinical trial) should also be reported. Do not forget to specify the statistical methods used in analyzing the results. Define the statistical terms, abbreviations, and most symbols. Specify the computer software used.

**(viii) Discussion:** This section includes the interpretation of the results. It is a contextual analysis of the data explaining its meaning in sentence form. It should be in an organised manner from general to specific. Your findings are to be linked to the literature. It should also be converted to theory, then to practice if appropriate. Results from other studies can be compared. If it is not consistent possible reasons can be explained. Limitations of your study has to be revealed. So that reviewers and readers understand that you have considered your experiment's weaknesses. If there are inconclusive results that also can be explained. Additional experiments needed, can also be suggested.

In core, discussion is nothing but what your results may mean for other researchers in the same area, other areas and also the general public. Can your findings have an application? How do you relate the findings with previous studies? These are also a thought to be added in the discussion.

**(ix) Conclusion:** Introduction gives a first impression to the reader, while conclusion provides not the last but lasting impression. This can be done with highlighting key points in your findings. Conclusion also places your study within the context of past research about the same topic.

After restating the research topic its importance can be summerised in one sentence. The thesis of the research can be put up next.

Even though you write same matter that was mentioned in the introduction, the wording should be different. Main points of your paper have to be summed up, next. Main points of your arguments with their significance can be stated. The conclusion should offer a new insight and creative approaches for framing another research problem based on the results of your study.

**(x) Acknowledgements:** This section should include credit to technical assistance, financial support and other appropriate recognition for the research work reported.

Due acknowledgement has to be given to all those who helped the author intellectually, academically or professionally. In certain occasions credits for images are also to be given.

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3. Halpen-Felsher BL, Morrell HE. Preventing and reducing tobacco use. In: Berlan ED, Bravender T, editors. Adolescent medicine today: a guide to caring for the adolescent patient [Internet]. Singapore: World Scientific Publishing Co.; 2012 [cited 2019 Nov 3]. Chapter 18. Available from: [https://doi.org/10.1142/9789814324496\\_0018](https://doi.org/10.1142/9789814324496_0018)
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6. Subbarao M. Tough cases in carotid stenting [DVD]. Woodbury (CT): Cine-Med, Inc.; 2003. 1 DVD: sound, colour, 4 3/4 in.
7. Stem cells in the brain [television broadcast]. Catalyst. Sydney: ABC; 2009 Jun 25.

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## AIMS AND OBJECTIVES

Aim of ĀRYAVAIDYAN is to promote research in ayurveda and allied subjects by disseminating the outcome into the scientific fraternity. The journal wishes to inculcate scientific writing especially among *ayurveda* scholars. It will promote incorporation of current knowledge with *ayurveda* to make it in tune with times. Each issue of ĀRYAVAIDYAN is expected to reflect the new developments in the fields of *ayurveda* and related knowledge systems. Documentation, validation and dissemination of principles and practices of Kerala school of Ayurveda is also an area of special interest to ĀRYAVAIDYAN. Journal will promote originality and innovation in scientific work. Documentation of evidence based *ayurveda* is the principle aim of the journal. ĀRYAVAIDYAN will not support any kind of malpractices in publication.

Objectives: The journal is devoted to publish the issues in the months of January, April, July and October with peer reviewed conceptual and clinical research articles on *ayurveda* with its different branches ie. *Kaayacikitsa*, *Kaumaarabhr̥tya*, *Maanasarogacikitsa*, *Saalaakyatantra*, *Salyatantra*, *Agadatantra*, *Rasaayana* and *Vaajeekarana*. The foundational systems of *ayurveda* like *dosha-siddhaanta*, *Dravyagunavijnaana*, *Sareeravijnaana*, *Bhaishajyakalapana*, *Rasaśaastra*, *Pancakarma*, *Svasthavṛtta*, *Padaarthavijnaana* are also considered.

Works from allied Indian knowledge systems like *Nyaaya*, *Vaiśeshika*, *Saangkhya*, *Yoga*, *Vedaanta* and *Poorvameemaamsa* in relation to *ayurveda* is included in the journal. Information from other ancient branches of Sanskrit knowledge systems like *Hastyayurveda*, *Aśvayurveda*, *Vṛkshayurveda*, *Vaastutantra*, *Aagama*, etc. if scientifically interpreted may be considered for publication. Outcome of literary researches related to *ayurveda* texts so as to enrich the study of evolution of *ayurveda* will also be accepted for the journal.

Research articles related to drug production like processing, quality assurance etc. and plant related studies in botany, biochemistry, pharmacognosy, phytochemistry, pharmacology, ethnobotany survey of medicinal plants, nutraceuticals, drug standardization, biotechnology, agriculture, horticulture, pharmacovigilance, etc. are important to the journal.

ĀRYAVAIDYAN will provide an inter-disciplinary platform for linking traditional knowledge with the current one. Types of articles include original research articles, review articles, short communications and case studies and book reviews. Finally the articles should be illuminating to *ayurveda*. It also should be educative. Clinical interest is given more stress.



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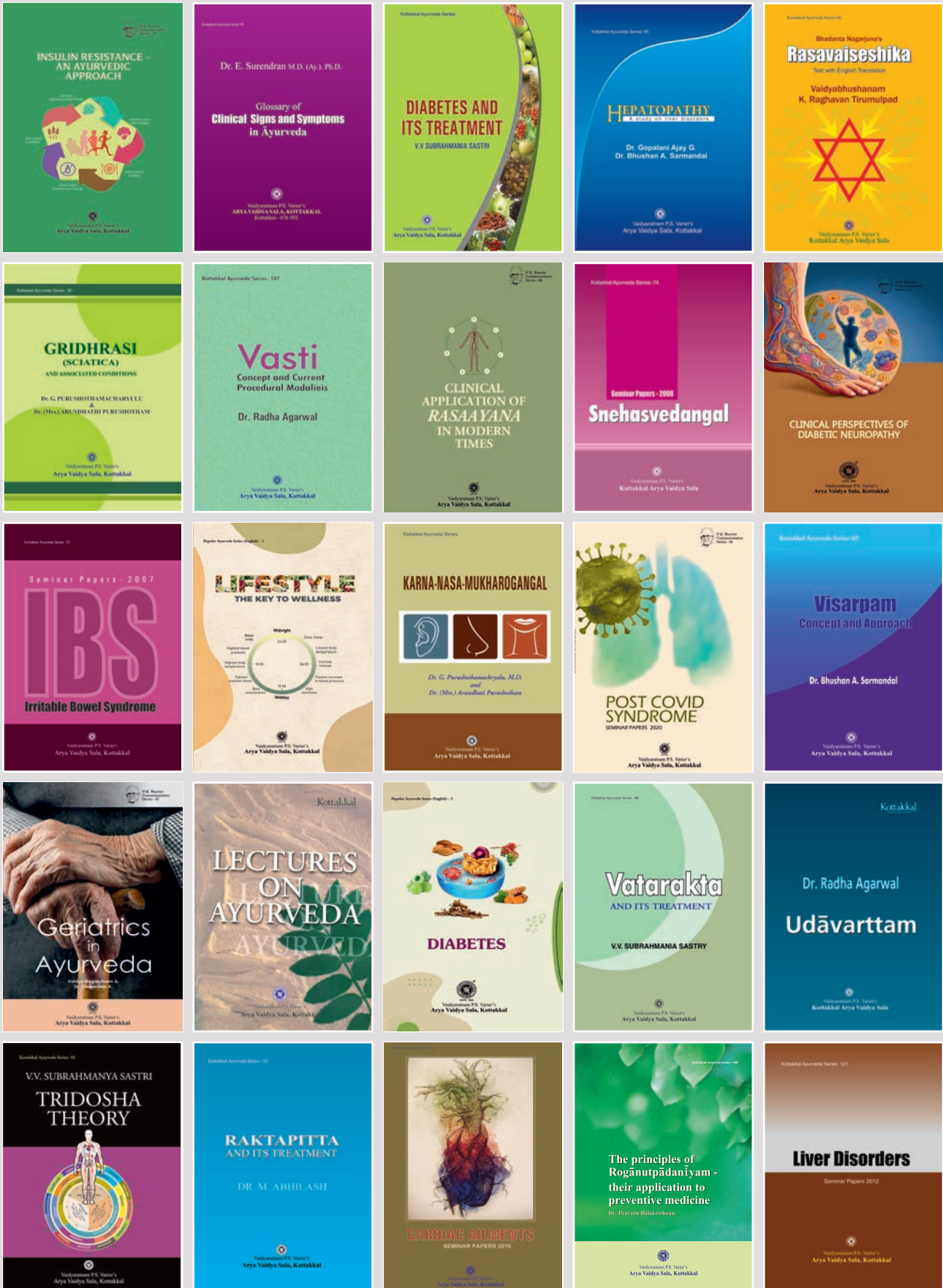
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