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RESEARCH ARTICLE

AYURVEDIC MANAGEMENT OF AXIAL SPONDYLOARTHROPATHY– A CASE REPORT

*Yogesh Kumar Pandey and Neha Kaushik

Ch. Brahm Prakash Ayurved Charak Sansthan

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*Corresponding author:

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ABSTRACT

Non- radiographic spondyloarthropathy (nr-SpA) and Ankylosing spondylitis (AS) are subtypes of axial spondyloarthritis (axSpA). patients with AS exhibit radiologic abnormalities consistent with sacroiliitis, with no evidence on plain radiograph. Instead, in nr-axSpA, the diagnosis is supported by evidence of active inflammation of sacro-iliac (SI) joint on magnetic resonance imaging (MRI) and/or a combination of other findings. Clinical importance of considering the two conditions differently is to understand the critical question whether inflammation and new tissue formation in SpA are linked or uncoupled processes. This case was treated considering both the pathologies as the stages of same disease, hypothesized as active inflammation at the joint (due to mechanical stress and/or degeneration) occurring primarily. This along with environmental factors trigger the genetic determinant which in turn activate the immune system and polymorphisms in cytokines and cytokine processing molecules that lead to either more severe inflammation or delayed clearance of inflammation. Auto immune responses induce abnormal surrogate tissue formation at the stress site lead to ankylosis of spine. Treatment done considering the primary stage as sandhivata which developed as its complicated form aamavata showed substantial relief in pain and functional ability of the patient.

INTRODUCTION

Ankylosing spondylitis (AS), a spondyloarthropathy, is a chronic, multisystem inflammatory disorder involving primarily the sacroiliac (SI) joints and the axial skeleton. Other clinical manifestations include peripheral arthritis, enthesitis (inflammation of the sites where tendons or ligaments insert into the bone), and extra articular organ involvement. Non-radiographic axial spondyloarthropathy (SpA) is a term used to describe the patients of clinical features of AS but with normal plain radiographs of the sacroiliac joints and spine. The spondyloarthropathies are linked by common genetic (the human leukocyte antigen [HLA] class-I gene HLA-B27) and a common pathology of enthesitis and other associated factors include age, environmental factors and infectious agents. AS is the most common of the classic spondyloarthropathies. It occurs in 0.1-1% of the world general population. It is more common in whites than in non-whites. Approximately 1-2% of all people who are positive for HLA-B27 develop AS. This increases to 15-20% if they have a first degree relative with HLA-B27 positive AS. 10-20% of all patients experience symptom before age 16 years (juvenile-onset AS). Clinical AS is more common in men than in women with a male to female ratio of approximately 3:1ⁱ. Around 0.25% of population in India is estimated to be affected by this disease and no. of cases in Asia are approximately 4.63-4.98 millionⁱⁱ.

There are very few effective treatments for AS, which causes substantial morbidity. Also, no therapy has been shown to slow the progression of axial disease in patients with ankylosing spondylitis. A 24 yrs. old, male patient with HLA-B27 positive with no first degree relative of HLA-B27 positive and thoracic kyphosis got admitted to *kayachikitsa* department for stiffness and restricted movements in lower back which resolves after movements. There was stabbing pain in dorso-lumbar region and in posterior aspect of ankle joint after physical exertion. Patient suffered from acute attacks (twice a year) of pain in dorso-lumbar region to an extent that led him to bed completely for which he used to take sulfasalazine 500mg bd for 15 days. Patient was diagnosed and treated on the lines of *aamavata*. There is *aama* (toxins formed by improperly digested food) formation which caused vitiation of *vata*ⁱⁱⁱ throughout the body. *Aama* and *prakupita* (vitiating) *vata* reaches the site where *kha vaigunya* (pathological site of the disease) is present mainly at kati (lumbosacral spine) and trika^{iv} (pelvic bone~ sacroiliac joint) region which are the major sites of *vyana vata* (type of *vata* responsible for circulation). *Aama* interacts with the components having similar properties (*sahdharmi*) like *sleshma* (phlegm) which is present in *sandhis*. This causes *savarana* (envelope) of *vata* by *aama* and *sleshma* (phlegm) which lead to stiffness in *trika sandhi* (sacroiliac joint) along with *guruta* (heaviness), *gati sangha* (restriction of movement) and *asthi sandhi peeda* v.

Oral medication- *Sanjeevni vati* 250mg bd, *godanti bhasm* 250mg, *mukta shukti bhasm* 250 mg, *ashwagandha churna* 25gm mixed together to form 21 equal doses for a week, *agnitundi vati* 250mg bd, *kaishore guggulu* 1.5gm in three divided doses, *nagaradi kwath* 60ml bd for 16 days along with *panchkarma* procedures of *sarvanga patra pind swedana* (PPS) with *brahita saindhavadi tail* for 16 days. *Basti* has been given in *kala basti* manner. *Niruha* with *rasna erandadi kwath* with castor oil 300ml empty stomach (total 6 *basti*) and *Anuvasana* with *dhanvantar tail* 75ml after lunch (total 10 *basti*). Follow up with same oral medications has been done for 3 months. There have been a significant and sustained improvement. No episode of acute attack occurred in last 6 months.

Presenting concerns: Patient is a 24 yrs. old, male, non-smoking, non- alcoholic, belonging to the rich Punjabi family. He is a mechanical engineer by profession working 10 hours a day (sitting job). Patient is suffering from stiffness and restricted movements in lower back, stabbing pain in dorso-lumbar region and pain in posterior aspect of ankle joint. He was on allopathic treatment, taking sulfasalazine 500mg bd from last 2 years as and when required and undergone physiotherapy and acupuncture treatment in 2017.

Clinical findings: There is no relevant history of AS in first degree relatives, his maternal uncle (mamaaji) and his first cousin are suffering from AS. Patient is non-hypertensive, non-diabetic and there is no history of any chronic illness other than that he was 108 kg in 2014, he reduced his weight by doing gym for 6 months and came to 72kg. On examination there was thoracic kyphosis resulting in slightly stopped posture. Although there was no tenderness present at sacroiliac (SI) joint (elicited by direct pressure on SI joint). There was stiffness of the spine with limited active and passive range of movement (ROM) at cervical and thoraco lumbar region. Also, there was tenderness present at achilles tendon (posterior aspect of ankle joint) bilaterally. There was no peripheral joint tenderness and any other extra-articular manifestation present. On examination-

Roga pariksha (nidana panchaka): *Nidana – abhishyandi ahara* (food causes stagnation) followed by *vyayama* (physical exercise) [history of eating oily and fried junk food and doing gyming sessions for 6 months].

- **Purvaroop-** *parva bheda* (pain in joints), *sandhi shola* (pain in articulating structures) and *kubjata* (~ thoracic kyphosis).
- **Roopa** – *stabdhata* (stiffness) and *gatisangha* (restricted movements) in lower back dandamushtihata peeda (stabbing pain) in thoraco-lumbar region and pain in posterior aspect of ankle joint.
- **Upshaya** – pain and stiffness resolve after activity
- **Anupshaya** – inactivity, cold weather, night time.
- **Samprapti** – (see figure 1).

Aamavata: (Axial spondyloarthritis)

Dashvidha aatura pariksha:

- *Prakriti- pitta kaphaja.*
- *Vikriti – madhyama bala.*
- *dosha- aama, kapha and vata.*
- *dushaya- asthi sandhi.*

- *prakriti – vata kaphaja.*
- *desha- sadharana,*
- *kala- Hemant- shishiraritu (kapha sanchaya kala).*
- *Sara- madhyama sara.*
- *Samhanana- madhayama.*
- *Pramana- madhyama.*
- *Satmya- madhaya bala satmaya.*
- *Satva- madhyama.*
- *Ahara shakti- madhyama.*
- *Vyayama shakti- madhyama.*
- *Vaya – madhyama.*

Diagnostic focus and assessment

Patient was provisionally diagnosed on the basis of

- HLA-B27 PCR positive. (29/6/2014)
- X -ray of thoraco lumbar spine shows kyphosis in thoracic spine. (5/2/2015)
- ESR- 86 mm/hr, CRP- 15.0 mg/l, vitamin D, 25-hydroxy, serum- 18.50nmol. (2/9/2017).
- The Assessment of Spondyloarthritis International Society (ASAS) classification criteria for axial spondyloarthritis (SpA) for diagnosis of the SpA^{vi} is used. Visual analogue scale (VAS), BASMI (Bath Ankylosing Spondylitis Metrology Index), BASFI (Bath Ankylosing Spondylitis Functional Index) and NRS (numerical rating scale for assessment of disease activity).

The diagnosis of AS is generally made by combining clinical criteria of inflammatory back pain, enthesitis and radiographic changes. Early and insidious onset of symptoms, HLA-B27 positive with the features of pain and stiffness in lower back after inactivity (morning) which relieves by activity since more than 3 months (ASAS criteria) makes the provisional diagnosis.

Differential diagnosis includes degenerative disc disease (DDD), lumbar disc disease (LDD), congenital spinal deformity, psoriatic arthritis, osteoarthritis, arthritis associated with inflammatory bowel disease (IBD). Absence of radiographic features of degeneration of spine and extra articular manifestations (skin lesion, bowel irregularity and indigestion) rule out other possible diagnosis. Presence of thoracic kyphosis could be congenital but HLA-B27 positive with pain at achilles tendon (enthesitis) further substantiate the diagnosis.

Therapeutic focus and assessment (table 2 and 3):

Pharmacologic interventions along with *panchkarma* procedures are done. Proper exercise programs with genetic counselling was done. *Pranayama* (breathing exercise) to avoid pulmonary complications was advised. Follow ups were done accordingly F1 on 7/1/2018 (9 days after discharge), F2 on 16/2/2018 (after 9 days), F3 on 19/3/18 (1 month later) as the patient was out of station could not come for follow up that month.

There was no adverse effect or any unanticipated event noticed during the treatment. Substantial improvement was found in symptoms as shown by the assessment tools other than VAS score increased in 2nd and 3rd follow up because of the excessive physical activity done as reported by the patient (he has gone for tracking in Rishikesh).

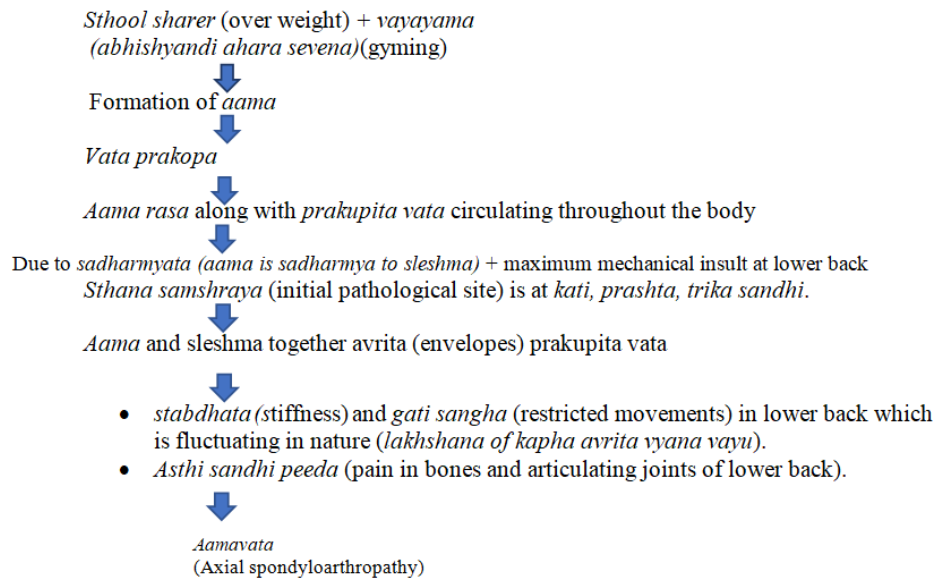


Figure 1. Samprapti (pathogenesis of the disease)

Table 1. Timeline of the case

YEAR	EVENTS
2007 Pt. was 12yrs old	<ul style="list-style-type: none"> • Patient experienced stretching pain in lower back while climbing stairs for the first time which resolved by itself in 2 days.
2013	<ul style="list-style-type: none"> • Patient weight was 108 kg. Exercised in gym for 6-7 months (no spinal exercise was involved) and felt continues diffuse pain in whole back since then.
27/6/2014	<ul style="list-style-type: none"> • Patient's HLA -B27 was positive, pain continued.
14/7/2014	<ul style="list-style-type: none"> • CRP-26.1 mg/dl (increased)
	<ul style="list-style-type: none"> • Patient came across severe neck pain. • X-ray thoracolumbar spine shows kyphosis in thoracic spine. • Took physiotherapy – thoracolumbar strengthening exercise. • Extension exercise. • Aerobic conditioning. • Pain reduced, became tolerable and patient continued with the pain.
2015-2017 2/9/2017	<ul style="list-style-type: none"> • Took treatment for ankylosing spondylosis. • Initially took tb. Sulfasalazine 500mg SOS (according to patient twice a year) which increased to the course of 500mg twice a day for 15 days once in 3 months in 2017. • ESR- 86mm/hr, TLC- 6.78 thou/mm³. • CRP- 15mg/L (increased) • Vitamin D₂₅-Hydroxy – 18.50 nmol/L (decreased)
11/12/2017	<ul style="list-style-type: none"> • Patient consulted in the kayachikitsa opd with complaints of – • Stiffness and restricted movements in lower back (resolves after movements). • Stabbing pain in thoraco-lumbar region. • Pain in posterior aspect of ankle joint. • Visual analogue scale (VAS)- 6 • BASMI (Bath Ankylosing Spondylitis Metrology Index)-6 • BASFI (Bath Ankylosing Spondylitis Functional Index) – 4.3
11/12/2017-28/12/2017	<ul style="list-style-type: none"> • Patient was treated with- • Oral medication-<i>Sanjeevni vati 250mg, Godanti bhasm 250mg, Mukta shukti bhasma 250mg, Ashwagandha churna 5gm mixed together and divided in 21 equal doses weekly.</i> • <i>Agnitundi vati 125mg bd.</i> • <i>Kaishore guggulu 1.5gm in 3 divided doses.</i> • <i>Nagaradi kwath 60ml twice daily.</i> • <i>Panchkarma</i> procedures • <i>sarvanga patra pind swedana (PPS) with brahita saindhavadi tail.</i> • <i>Niruha with rasna erandadi kwath with castor oil and anuvasana with dhanvantar tail in kala basti manner.</i>
29/12/2017	<ul style="list-style-type: none"> • Clinical evaluation for the symptoms done- • VAS- 4 • BASMI-5.34 • BASFI – 2.8 • Patient discharged on oral medication <i>Sanjeevni vati 250mg, godanti bhasm 250mg, mukta shukti bhasma 250mg, ashwagandha churna 5gm mixed together and divided in 21 equal doses weekly.</i> • <i>Agnitundi vati 125mg bd.</i> • <i>Kaishore guggulu 1.5gm in 3 divided doses.</i> • <i>Nagaradi kwath 60ml twice daily.</i> • <i>laghu vish garbha tail</i> for local application. • The case is under continuous follow up.

HLA =Human leukocyte antigen, ESR = Erythrocyte sedimentation rate, Hb =Hemoglobin, TLC =Total leucocyte count, CRP =C-reactive protein.

Table 2. Pharmacological interventions

S.no	Oral intervention	Detail of intervention	Dose	Anupana	Duration
1.	<i>Nagaradi kwath</i>	<i>Shunthi</i> (zingiber officinale Roscoe), <i>guduchi</i> (<i>tinospora cordifolia</i> Thunb. Miers), <i>haritki</i> (<i>Terminalia chebula</i> Retz)	60 ml twice a day	Empty stomach	3 months
2.	<i>Kaishore guggulu</i>		1.5gm a day in three equally divided doses.	Luke warm water q.s. after meals.	3 months
3.	<i>Agnitundi vati</i>	<i>Shudh parada</i> , <i>shudh gandhaka</i> , <i>vatsnabha</i> (<i>Aconitum ferox</i> Wall.ex Ser), <i>kuchala</i> (<i>strychnos nuxvomica</i> L.)	250mg a day in two equally divided doses.	Luke warm water q.s. after meals.	3 months
4.	<i>Ashwagandha churna</i>	<i>Ashwagandha</i> (<i>withania somnifera</i> L. Dunal)	25gm	Luke warm water q.s. after meals.	3months
	<i>Sanjeevni vati</i>	<i>Vatsanabha</i> (<i>Aconitum ferox</i> Wall.ex Ser), <i>bhallataka</i> (<i>semicarpus anacardium</i> L.f.), <i>guduchi</i> (<i>tinospora cordifolia</i> Thunb. Miers)	250mg		3 months
	<i>Godanti bhasm</i>		250mg		3 months
	<i>Mukta shukti bhasm</i>		250mg		3 months
			Mixed together and divided in 21 equal doses for 7 days.		
5.	<i>Laghu vishgarbha taila</i>		For local application.		3 months

Table 3. Panchkarma procedures

S.no.	Intervention	Method of preparation	Method of administration	Dose	Duration
1.	<i>Sarvanga Patra pind swedana</i> (PPS) with <i>saindhavadi tail</i> .	Leaves of <i>vatahara dravyas</i> (<i>eranda</i> , <i>nirgundi</i> , <i>arka</i> , <i>chinch</i> , <i>methika</i> , <i>haridra</i> , <i>saindhava lavana</i>) are cooked and tied in a cotton cloth in the form of <i>pottali</i>	The warm <i>pottali</i> is dipped in <i>saindhavadi tail</i> and applied over the body massaged for 15 min.	q.s.	16 days
2.	<i>Kala basti</i>				
	<i>Niruha basti</i>	<i>Rasna erandadi niruhawith</i> castor oil.	given with <i>basti</i> yantra before meals.	300ml	Total 6 <i>basti</i> in <i>kala basti</i> manner
	<i>Anuvashana basti</i>	<i>Dhanvantar taila</i>	given with <i>basti</i> yantra after meals.75 ml <i>tailamixed</i> with rock salt	75 ml	Total 10 <i>basti</i> in <i>kala basti</i> manner.

Table 4. Follow up and outcomes

Domain	Instruments	BT	AT	F1	F2	F3
Pain	VAS	6	4	2	3	3
Stiffness	NRS	8	3	4	4	4
Enthesitis	MASES	4	2	-	-	-
Function	BASFI	4.3	2.8	2.0	1.4	1.4
Spinal mobility	BASMI	6	5.34	-	-	-

DISCUSSION

This case was treated on the lines of *aamavata*. *Langhana* (deprivation treatment), *swedana* (fomentation therapy), *deepana* (stomachic) and *basti* (introduction of medicinal decoctions through rectum) are the line of treatment in *aamavata*^{vii}. The treatment in this case have been done considering following aspects:

- *Deepana* and *pachana* of already formed *aama* in the body and for proper formation of new pure *ahara rasa* (nutritional essence formed after proper digestion of food).
- *Sroto shodhana* (purification of micro channels) so that purely formed *ahara rasa* could reach to all the *dhatu*s for nourishment which already got emaciated with the toxic state of the *aama*.
- Providing *bala* (strength) to the body (especially the bones of the vertebral column) to avoid further deformity.

Nagaradi kwath contain *shunthi* which is *katu rasa* and *ushna virya* used as a *deepana* and *bhedana* and is *shothhara* and *vata kapha prashamana* and *guduchi* exhibit antimicrobial,

antioxidant and considerable inhibition against *Klebsiella pneumoniae*^{viii}. This gut microbe is known as one of the infectious triggering factor for the development of AS^{viii}. *Kaishore guggulu* contain drugs which are *tikta rasa* and *katu vipaka* and *ushna virya* which helps in complete digestion of food and *pachana of aama* (toxic substance formed due to impaired digestion), also *guggulu*^{xxi}, *guduchi*^{xix}, *shunthi*^x, and *trivrita*^{xv} relieve inflammation of the of intervertebral joints and surrounding structures. *Sanjeevni vati* relieves *ajirna awastha*^{xvi} (state of undigested food) which is the main cause of *aama* formation. Also, *godanti bhasm* (ash of gypsum) is *sheeta virya* hence, *balya* and also ignite *agni*^{xvii}. Since the patient is *pitta prakriti* and is suffering from *rasajirna* (state of undigested first *dhatu rasa*) *mukta shukti bhasma* is helpful in proper digestion of *ahara* and *pachana* of already formed *aama* without causing any side effects. *Agnitundi vati* is effective in *agnimandya*^{xviii} also, *kuchala* present in it is analgesic, anti-arthritis^{xix}, vasodilator and AChE activity inducer^{xx} which reduces the immunological inflammatory responses in articulating structures of the bones and prevent deformities. *Ashwagandha churna* (powder of *ashwagandha*) possesses anti-inflammatory, antitumor, anti-stress, anti-

oxidant, immunomodulatory and rejuvenating properties^{xxi}. *Niruha* with *rasna erandadi kwath* which contain *eranda* (*Ricinus communis* L.) (*vrishya vata haranama*)^{xxii} along with *rasna* (*Pluchea lanceolata* Cass.) pacifies *vata*. *Anuvasana* with *dhanvantar tail* serves the purpose of *brihangana* and also not letting *vata* to get vitiate. *Patra pind swedana* (PPS) made of *vatahara dravyas* with *saindhavadi tail* contains *lavana* (*saindhava*, *sauvarchala*, *vida*) which when applied locally increases the permeability of the skin provide passage for other nutrients to enter in the skin reduces the pain reduces the local muscle spasms and swelling.

Conclusion

The patient with the clinical features of axial spondyloarthritis have been treated on the lines of *aamavata*. *Langhana* (deprivation treatment), *swedana* (fomentation therapy), *deepana* (stomachic) and *basti* (introduction of medicinal decoctions through rectum) have been done for resolving *aama avastha*, proper metabolism of food and pacifying *vata* (*avarana janya prakopa*) for management of pain and stiffness. Clinical features of the sacroiliac joints and spine probably represents an earlier phase or milder form of AS. This approach may be taken into consideration for early diagnosis of AS and as a preventive measure for the pathology to develop.

Patients perspective: Patient was satisfied with the treatment and was able to walk without any aid, stiffness was reduced in the lower back.

Patients consent: Written permission for publication of this case study had been obtained from the patient.

Source of support: Nil

Conflicts of interest: Not declared

REFERENCES

- i. Brent LH, Ankylosing Spondylitis and Undifferentiated Spondyloarthritis, Medscape, updated [Dec 25,2017], <https://emedicine.medscape.com>.
- ii. Dean L.E., Jones G.T., MacDonald A.G. et al, Global prevalence of ankylosing spondylitis, *rheumatology* 2014;53:650-657, <https://scholar.google.co.in>.
- iii. Shastri K. Chaturvedi G. *vata vyadhi chikitsa adhyaye*. Shastri R. (ed.), *Charak Samhita. Vidyotini hindi vyakhya*, Vol.2 Chaukhamba Bharti Academy, 2011; 28:779:17.
- iv. Sastri L., *Aamavata nidana, yogratnakar vidyotini hindi vyakhya*, chaukhamba prakashana 2012; 564,565:2.
- v. Shastri K. Chaturvedi G. *vata vyadhi chikitsa adhyaye*. Shastri R. (ed.), *Charak Samhita. Vidyotini hindi vyakhya*, Vol.2 Chaukhamba Bharti Academy, 2011; 28:815:228.
- vi. Lipton S., Deodhar A. 2012. The New ASAS Classification Criteria for Axial and Peripheral Spondyloarthritis, *International Journal Of Clinical Rheumatology*, 7(6):675-682, <https://www.medscape.com>.
- vii. Upadhyaye Y. 2009. *Aamavata nidana, Madhava nidana, chaukhamba prakashana vol 1*:28:
- viii. Mishra A., Kumar S., Pandey A.K. 2013. Scientific Validation of the Medicinal Efficacy of *Tinospora Cordifolia*, *The Scientific World Journal*; volume: 292934. <http://dx.doi.org/10.1155/2013/292934>.
- ix. Brent LH., Ankylosing Spondylitis and Undifferentiated Spondyloarthritis, Medscape, updated [Dec 25,2017], <https://emedicine.medscape.com>.
- x. Shishodia S., Aggarwal BB. 2004. Guggulsterone inhibits NF- κ B and Ikappa Balpha kinase activation, suppresses expression of anti-apoptotic genes products and enhance apoptosis. *J Biol. Chem.*, 279(45): 47148-47158.
- xi. Thapa DM., Dongra J. 1994. Nodulocystic acne oral guggulipid versus tetracycline. *J Dermatol.*, 21: 729.
- xii. Jana U, Chattopadhyay RN, Shw BP. 1999. Preliminary studies on anti-inflammatory activity of *Zingiber officinale* Rosc., *Vitex negundo* Linn. and *Tinospora cordifolia* (Willd) Miers in albino rats. *Indian J Pharm.*, 31: 232-233.
- xiii. Sharma AK., Singh RH. 1980. Screening of anti-inflammatory activity of certain indigenous drugs on carragenin induced hind paw oedema in rats. *Bull Medico Ethenobot Res.*, 1(2): 12.
- xiv. Raji Y, Udoh US, Oluwadara OO, Akinsomisoye OS, Awobajo O, Adeshoga K. Anti-inflammatory and analgesic properties of the rhizome extract of *Zingiber Officinale*. *African Journal of Biomedical Res.* 2002; 5: 121 -124.
- xv. Bhande RM., Laakshmayya KP., Mahurkar NK., Setty SR. 2006. Pharmacological screening of root of *Operculina turpethum* and its formulations. *Acta Pharmaceutica Scientia.*, 48: 11-17.
- xvi. Murthy S. 2009. *dhatu shodhanamarana Kalpana, sharangadhar Samhita, chaukhamba orientalia*, 8;103:18-21.
- xvii. Sharma S., talakadi vigyanaiyaum, ras tarangini, N.A.B. printing unit, 2014; 11;284:241.
- xviii. Murthy S. 2009. *Dhatu shodhanamarana Kalpana, sharangadhar Samhita, chaukhamba orientalia*, 11;178:222-224.
- xix. Bani S., Kaul A., Khan B. suppression of T lymphocyte activity by lupeol isolated from *Crataeva religiosa*. *Phytother Res* 2006;20:279-87.
- xx. Lee KY., Sung SH., Kim SH. 2009. Cognitive-enhancing activity of loganin isolated from *Cornus officinalis* in scopolamine-induced amnesic mice. *Arch pharmacol Res.*, 32:677-83.
- xxi. Mishra L C., Singh B., Dagenals S. 2000. Scientific basis for the therapeutic use of *Withania somnifera* (ashwagandha): a review, *Alternative medicine review* 5 (4), 334-346, <https://scholar.google.co.in>.
- xxii. Shastri K. 2007. *Yajyapurushiya adhyaye*. Pandeya G. (ed.), *Charak Samhita. Vidyotini hindi vyakhya Vol.1 Chaukhamba Bharti Academy*, 25:319;40.
