

# Role of Ayurveda treatment in the management of hepatitis B (*Ubhayapatha Ashrita Swatantra Kamala*)- A case report

Jitendra Varsakiya, Mandip Goyal, Ritu Kumari, Divyarani Kathad<sup>1</sup>

Department of Kayachikitsa, Chaudhary Brahm Prakash Ayurved Charak Sansthan, New Delhi, <sup>1</sup>Department of Shalakya Tantra, Akhandanand Ayurved College, Ahmedabad, Gujarat, India

## Abstract

Hepatitis B is one of the most common causes of liver disease, and due to unawareness of the safety measures, more prone to spread. As per the World Health Organization, for the South East Asia region, its prevalence is 2%. Yellowish discoloration of the eyes, body, and urine, abdominal discomfort, and vomiting is its cardinal symptoms. In Ayurveda, this set of symptoms is known as *Kamala*. This case report illustrates the effectiveness of the Ayurveda treatment modality in a patient with a viral load of 3705.71 IU/ml, and the values of AST (aspartate aminotransferase) and alanine transaminase (ALT) were 140 IU/ml and 173 IU/ml, respectively. A 40-year-old female patient with a complaint of yellowish discoloration of urine, eyes, and skin with fatigue and irritability was diagnosed with *Ubhayapatha Ashrita Swatantra Kamala*. The patient was treated with Ayurveda drugs and *Virechana Karma* (therapeutic purgation). After the treatment for 13 months, the disease was cured. Improvement was observed based on hepatitis B virus deoxyribonucleic acid (DNA) polymerase chain reaction (PCR) (hepatitis B DNA PCR) (decreased from 3705.71 IU/ml to <50.0 IU/ml) and the values of AST (decreased from 140 IU/ml to 19.0 IU/ml) and ALT (decreased from 173 IU/ml to 28 IU/ml). The patient was stable and asymptomatic during the follow-up period of 4 months.

**Keywords:** *Ayurveda*, hepatitis B, jaundice, *Kamala*, *Virechana Karma*

## Introduction

Hepatitis B virus (HBV) infection is one of the most common causes of liver diseases ranging from acute hepatitis to chronic hepatitis, liver cirrhosis, and hepatocellular carcinoma (HCC).<sup>[1]</sup> Over two billion people worldwide have been infected with HBV, and more than 350 million are chronically infected carriers.<sup>[2]</sup> The virology diagnosis and monitoring of the HBV infection are based on immunoassays detecting viral antigens and specific anti-HBV antibodies, as well as nucleic acid detection assays targeting the genomic material of the virus.<sup>[3]</sup> In comparison with immunoassays, HBV deoxyribonucleic acid (DNA) detection and quantification are more useful in the diagnosis of infection, therapeutic decision-making, and assessment of the response to therapy.<sup>[4]</sup> In addition, HBV DNA quantization can be used to monitor viral replication kinetics to understand better the mechanisms of infection and the virologic response to antiviral therapy. The ultimate goals of hepatitis B treatment are to decrease mortality by alleviating hepatic inflammation and preventing the development of fibrosis, which ultimately reduces the frequency of progression of

hepatitis to liver cirrhosis or HCC,<sup>[5]</sup> as the main pathological factor behind these diseases is inflammation which turns in to fibrosis. Antiviral therapy is the primary treatment modality of current hepatitis management. Furthermore, the efficacy and side effects of these drugs may vary depending on the clinical situation.<sup>[6]</sup> Alanine transaminase (ALT) normalization, undetectable HBV DNA, hepatitis B surface antigen loss, or seroconversion can be treatment aims or endpoints.<sup>[7]</sup>

In Ayurveda, this disease condition bears symptomatic resemblance with *Kamala*, where cardinal symptoms are *Haridra Netra* (yellowish discoloration of eyes), *Haridra Twak Nakha Aanana* (yellowish discoloration of skin, nails, and face), *Rakta Pita Shakrita Mutra* (reddish yellow color

**Address for correspondence:** Dr. Jitendra Varsakiya,  
Department of Kayachikitsa, Chaudhary Brahm Prakash Ayurved  
Charak Sansthan, Khera Dabar, Najafgarh, New Delhi - 110 073, India.  
E-mail: jeet12989@gmail.com

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

**For reprints contact:** WKHLRPMedknow\_reprints@wolterskluwer.com

**How to cite this article:** Varsakiya J, Goyal M, Kumari R, Kathad D. Role of Ayurveda treatment in the management of hepatitis B (*Ubhayapatha Ashrita Swatantra Kamala*) - A case report. AYU 2022;43:13-7.

**Submitted:** 27-Jan-2021

**Revised:** 28-Apr-2022

**Accepted:** 21-Feb-2023

**Published:** 24-Jun-2023

### Access this article online

Quick Response Code:



**Website:**  
www.ayujournal.org

**DOI:**  
10.4103/ayu.ayu\_17\_21

of feces and urinals), *Hatendriya* (weakness of senses), *Avipaka* (indigestion), *Daurbalya* (generalized weakness), and *Aruchi* (anorexia).<sup>[8]</sup> Acharya Vagbhatta has mentioned it as a complication of other ailments<sup>[9]</sup> that can be compared with toxic jaundice. In Ayurvedic literature, the treatment of *Kamala* has been broadly discussed. As *Kamala* is *Paittika Vyadhi* (diseases due to disturbed *Pitta Dosha*) and *Virechana Karma* (therapeutic purgation) is mentioned in classics for the treatment principle, Hence, Here it was considered *Shodhana Karma* (bio cleansing therapy) followed by *Shamana Chikitsa* (palliative treatment).

## Patient history

A 40-year-old Hindu female visited our center, CBPACS, Delhi, in December 2018, having central I. D. no. 162146, with the complaint of yellowish discoloration of urine, eyes, and skin from 2 months. The patient had also complained of fatigue with irritability and experiencing upper abdominal pain on and off. Patient had complain of 1–2 episodes of vomiting per day from 2 months.

Initially, these symptoms were mild, but gradually severity increased. For 2 months, she was taking allopathic medication such as antibiotics, Vitamin E capsules, probiotics, and proton-pump Inhibitors, but did not get relief. Meanwhile, on November 27, 2018, doctors did her liver function test (LFT) and HBV DNA polymerase chain reaction (PCR). Through the test report, she was found to be hepatitis B positive. Hence, she visited our center, for better care and support for her ailment.

On further inquiry, we learned that she did not have any blood transfusions in her life. Neither her children nor her husband has this infection. No family history of this disease was there. She did not have any surgical history. She had not been vaccinated for hepatitis B.

## Clinical findings

On physical examination, it was found that her conjunctiva, nail beds, and face were dark yellow. The patient was lethargic and restless. Her blood pressure was 100/70 mm Hg. The pulse rate was 70/min, which was feeble and regular. The patient was conscious and well-oriented to time, date, and place. On abdominal examination, there was no organomegaly, but the right hypochondriac region was tender. There were no signs of ascites. There was no puffiness of the face or edema on the body.

*Dashavidha Pariksha* (ten-fold examination of patient) was done which illustrated that patient was *Pitta Kaphaj* in *Prakriti* (physical constitution), *Vikriti* (morbidity) – *Pitta*, had moderate physical status with *Avara Vyayam Shakti* (lesser power to perform physical activity), and *Avara Bala* (low strength).

*Astavidha Pariksha* (eight-fold examination of the patient) was done, which reveals *Nadi* (pulse)-*Kaphaja*, *Mootra* (urine)-*Rakta-Pita Varna* (reddish yellow), *Mala* (feces)-*Tila Pista Varna* (grayish), *Jihwa* (tongue)-*Sweta* (whitish),

*Ruksha* (dry), *Shabdham* (voice)-*Aspasta* (weak), *Sparsham* (touch)-*Sheeta* (cold), *Ruksha*, *Druk* (eyes and vision)-*Haridra Varna* (yellowish discoloration), *Akriti* (general body built)-*Madhyam* (moderate).

## Timeline

The timeline of events is depicted in Figure 1.

## Diagnostic assessment

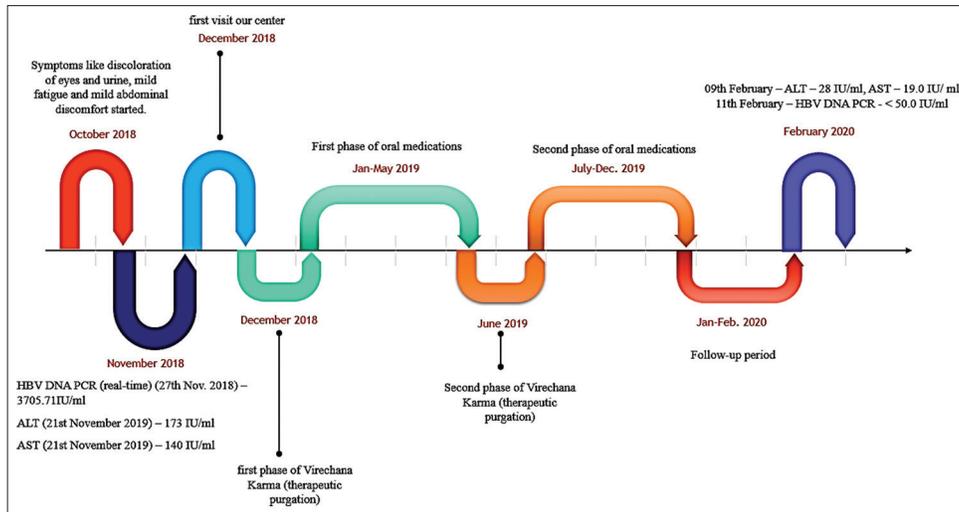
HBV DNA PCR test, which was done on November 27, 2018, showed viral load was 3705.71 IU/ml. LFT was done on November 21, 2018, and the value of AST (aspartate aminotransferase) and ALT was 140 IU/ml and 173 IU/ml, respectively [Figure 2]. To exclude HCC, alpha-fetoprotein test was done, which was negative.

The patient was diagnosed with jaundice due to hepatitis B virus infection. Symptomatically, this situation resembles *Kamala*, and more precisely, this patient could be diagnosed as *Ubhayapatha Ashrita Swatantra Kamala*.

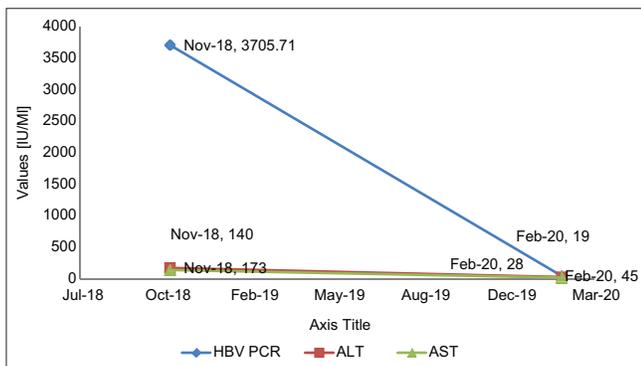
## Therapeutic intervention

After assessing the patient and taking consent, the whole treatment was planned in two phases; in each phase, *Virechana Karma* is followed by 6 months of oral medications. [Details mentioned in Table 1 and Figure 1]. In the first phase, before starting the oral medicine, *Virechana karma* was performed, 28 *Vega* (natural urges [for elimination]) were reported, and in the second phase, 25 *Vega* were reported. In both phases, there was *Kaphanta Virechana* (until mucus is seen as feces). No complications were observed during both phases. Seven days of *Samasarjana Krama* (posttherapy dietetic regimen for revival) were done in each phase, which included *Peya* (watery gruel prepared from Barley) for the first three diets, followed by *Vilepi* (thick gruel of rice), *Yusha* (soup prepared from green gram), and *Mamsarasa* (mutton soup) for succeeding three diets each.<sup>[10]</sup> After 1 week of *Samsarjana Krama*, oral medications were started. Oral medications were *Bhumi Amalaki Churna* (powder of whole dried plant of *Phyllanthus niruri* Linn.) (1 g) + *Sharpunkha Churna* (powder of whole dried plant of *Tephrosia purpurea* Linn.) (1 g) + *Katuki Churna* (powder of dried rhizome of *Pichrohiza kurroa* Royle ex . Benth) (1 g) + *Triphala Churna* (2 g) BD (two times in a day) with lukewarm water after lunch and dinner and *Aarogya Vardhini Vati* 500 mg TDS (three times in a day) with lukewarm water after breakfast, lunch, and dinner. All the drugs for *Panchakarma* and oral administration were procured from the hospital pharmacy of CBPACS, New Delhi.

During the entire treatment course and follow-ups, the patient was advised not to take oily, junk food. She was advised to take freshly home-cooked food timely. She was advised to take seasonal green vegetables with minimal or no spices with rice and buttermilk. Minimal use of electronic gadgets during the night and proper and fixed night sleep timing (10 PM–5 AM) was advised. She was encouraged to get up early and do *Pranayama* (control of breath) such as *Anuloma Viloma*,



**Figure 1:** Timeline of events. HBV PCR: Hepatitis B Virus polymerase chain reaction, ALT: Alanine transaminase, AST: Aspartate transaminase



**Figure 2:** Hematological changes observed during the treatment

*Kapala Bhati*, and *Omka* chant. *Pranayama* was advised to do it in the morning for 15–20 min daily.

### Follow-up and outcomes

Once the second phase of oral medications was done, an assessment of the patient was done based on subjective criteria [Table 2 and Figure 3], which revealed she was healthy. She was clinically stable also; therefore, medications were stopped, and ask her to do LFT, and HBV DNA PCR tests were performed. She came with these test reports in February 2020, which were negative for hepatitis B. During the follow-up period, i.e. for 2 months, the patient was advised to continue with *Pathya*.

### Discussion

Hepatitis B can be correlated with *Ubhayapatha Ashrita Swatantra Kamala*. There is no direct reference to hepatitis B in any Ayurvedic literature. This is an attempt of the author to correlate this. *Swatantra Kamala* in Ayurvedic literature is coined for *Kamala*, which is not originated as a complication of *Pandu Roga*.<sup>[10]</sup> *Ubhayapatha Ashrita Kamala* means that *Dosha* is present in *Koshtha* as well as *Shakha*. Hepatitis B bears symptomatic similarity with *Kamala* and

in this situation, *Kamala* is not a consequence of *Pandu*. In addition, hepatocellular malfunctions along with icterus and gastrointestinal tract disturbances are also there in hepatitis B. *Swatantra Kamala* is purely *Paittika Vyadhi* (diseases due to disturbed *Pitta Dosha*). When perturbed *Pitta* increases in excess amount, it will contaminate *Rakta Dhātu* (blood tissue); after this step only, features of *Kamala* become evident.<sup>[11]</sup> One of the roots of *Raktavaha Srotas* (channels carrying blood tissue) is *Yakrita* (liver).<sup>[12]</sup> *Kamala* is categorized under *Pittaj Nanatmaja Vyadhi* (diseases due only to vitiated *Pitta Dosha*) and *Rakta Pradoshaja Vyadhi* (diseases due to *Rakta Dosha*) also.<sup>[13,14]</sup> *Virechana* and administration of *Pittahara* drugs (drugs which alleviate *Pitta dosha*) are considered as a treatment of choice for *Kamala*.<sup>[15]</sup> *Virechana* drugs not only remove the *Dosha* present in the stomach and large gut but also of the entire body. *Virechana Dravya* has *Tikshna* (sharpness), *Ushna* (hotness), *Sukshma* (penetrating), *Vyavayi* (substances with quick spread even without digestion), *Vikasi* (property of substance resulting in quick spread and action) properties.<sup>[16]</sup> After the *Shodhana* (bio purification) process, remaining *Dosha* (regulatory functional factors of the body) is pacified by the administration of drugs which alleviates *Pitta dosha*, having *Madhura* (sweet), *Tikta* (bitter), and *Kashaya* (astringent) *Rasa* (taste). Drugs used in this study have a predominance of these properties.

Moreover, *Triphala* treatment suppresses the production of inflammatory mediators, intracellular free radicals, inflammatory enzymes, and lysosomal enzyme release.<sup>[17]</sup> *Katuki Churna* has been shown to reduce mortality due to hepatitis B (virus) hepatotoxicity. Its hepatoprotective effect appears to result from a combination of membrane stabilizing, hypolipidemic, and antioxidant properties.<sup>[18]</sup> The administration of this *Sharpunkha* extract decreases the necrosed area and the infiltration of the inflammatory cells in the liver lobules.<sup>[19]</sup> It also showed a significant increase in liver glutathione levels and a significant decrease in lipid peroxidation in the liver. *Bhumi Amalaki* has been observed to possess anti-viral and

**Table 1: Details of Virechana Karma**

| Procedure   | Drug and dosage   | Duration (days) |
|---|---|-----------------|
| <i>Deepana</i> and <i>Pachana</i> (improvement of digestive fire and digestion)     | <i>Avipattikar Churna</i> -2 g was administered twice a day with lukewarm water before lunch and dinner   | 3               |
| <i>Snehapana</i> (therapeutic internal oleation)                                    | On the 4 <sup>th</sup> day, after assessing the patient's status, <i>Mahatikta Ghrita</i> was started with 30 mL and increased by 30 mL on each consecutive day, early morning empty stomach, with lukewarm water<br>The patient was observed for <i>Sneha Jeerna Lakhshana</i> (proper digestion of <i>Ghrita</i> ) and accordingly, for the next 5 days, the dose of <i>Ghrita</i> was given in increasing pattern till the patient achieved proper <i>Snehana</i> (internal oleation) features | 5               |
| <i>Abhyanga</i> and <i>Vashpa Swedana</i> (oil massage and therapeutic fomentation) | After completing internal <i>Snehana</i> for the next 3 days, <i>Abhyanga</i> (whole body massage) was done with <i>Bala Taila</i> , twice a day for 20 min and <i>Sarvanga Vashpa Sweda</i> (steam fomentation) with <i>Dashamoola Kwatha</i> was performed for 10 min or until the patient feels comfortable  | 3               |
| <i>Virechana Karma</i> (therapeutic purgation)                                      | On the day of <i>Virechana</i> , after massage and fomentation in the morning, <i>Virechana Yoga</i> of <i>Katuki Churna</i> - 10 g, <i>Triphala Kwatha</i> - 100 mL, <i>Draksha Kwatha</i> - 100 mL was administered (9 am approximate). In the first phase, <i>Virechana Karma</i> was completed with 28 <i>Vega</i> and in the second phase, 25 <i>Vega</i> were reported. For both phases, <i>Virechana Yoga</i> and method were the same   |                 |
| <i>Samsarjana Krama</i> (posttherapy dietetic regimen for revival)                  | Regulatory diet regimen which including <i>Peya</i> (thin gruel of rice), <i>Vilepi</i> (thick gruel of rice), <i>Akrita Yusha</i> (nonprocessed soup of vegetables and/or pulses), and <i>Krita Yusha</i> (processed soup of vegetables and/or pulses) in a sequential manner  | 7               |

**Table 2: Assessment criteria for subjective assessment**

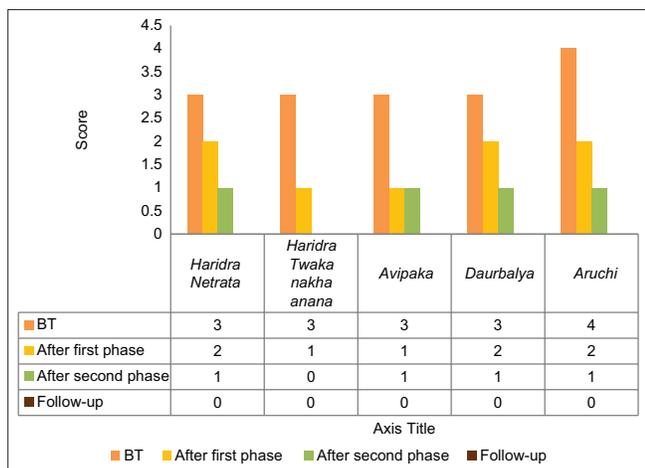
| Criteria  | Description  | Score |
|---|--|-------|
| <i>Haridra Netra</i> (yellowish discoloration of eyes)                              | Normal color of sclera   | 0     |
|   | Yellowish white color of sclera  | 1     |
|   | Yellow color of sclera   | 2     |
|   | Dark yellow color of sclera  | 3     |
|   | Greenish yellow color of sclera  | 4     |
| <i>Haridra Twaka Nakha Aanana</i> (yellowish discoloration of skin, nails and face) | Normal complexion of skin, nails, and face                                   | 0     |
|   | Yellowish white color of skin, nails, and face                               | 1     |
|   | Yellow color of skin, nails, and face  | 2     |
|   | Dark yellow color of skin, nails, and face                                   | 3     |
|   | Greenish yellow color of skin, nails, and face                               | 4     |
| <i>Avipaka</i> (indigestion)  | Able to digest any kind of eatables  | 0     |
|   | Able to digest normal food   | 1     |
|   | Able to digest light food but difficulty in digestion of normal food         | 2     |
|   | Unable to digest light food as juice, <i>Daliya</i> , <i>Khichadi</i> , etc. | 3     |
| <i>Daurbalya</i> (generalized weakness)   | No weakness  | 0     |
|   | weakness after doing some extra work other than daily routine work           | 1     |
|   | weakness after doing normal daily routine work                               | 2     |
|   | weakness without doing anything  | 3     |
| <i>Aruchi</i> (anorexia)  | Take a full diet on a proper gap   | 0     |
|   | Take moderate diet on proper gap between meals                               | 1     |
|   | Decreased amount of diet and the increased gap between meals                 | 2     |
|   | Unable to consume a minimum amount of diet on at least 2 meal time           | 3     |
|   | Unable to consume a minimum amount of diet in a whole day                    | 4     |

anti-bacterial properties,<sup>[20]</sup> protective effect on the liver,<sup>[21]</sup> anti-oxidant and anti-inflammatory properties,<sup>[22]</sup> and as an immunomodulator.<sup>[23]</sup>

*Aarogya Vardhini Vati* has a maximum proportion of *Kutaki* as its ingredient. Apart from this, it also has *Triphala* in it.<sup>[24]</sup> It has also effects on the enhancement of antioxidant enzymes, superoxide dismutase, glutathione, and catalase amylase activity in the body.<sup>[25,26]</sup>

## Conclusion

Despite the advancement of modern medical facilities and various awareness programs, hepatitis B is fatal till date. This is the need of the era to develop Ayurvedic protocols for various viral diseases. This study provides a lead where a patient who took ayurvedic medications along with *Panchakarma* therapy get cured with hepatitis B. By intensive practical studies with more subjects and with a



**Figure 3:** Subjective assessment of the patient

definite protocol will help to validate this combination more scientifically.

### Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

### Financial support and sponsorship

Nil.

### Conflicts of interest

There are no conflicts of interest.

## References

- Rehermann B, Nascimbeni M. Immunology of hepatitis B virus and hepatitis C virus infection. *Nat Rev Immunol* 2005;5:215-29.
- Liang TJ. Hepatitis B: The virus and disease. *Hepatology* 2009;49:S13-21.
- Liu YP, Yao CY. Rapid and quantitative detection of hepatitis B virus. *World J Gastroenterol* 2015;21:11954-63.
- Lai MW, Lin TY, Tsao KC, Huang CG, Hsiao MJ, Liang KH, et al. Increased seroprevalence of HBV DNA with mutations in the s gene among individuals greater than 18 years old after complete vaccination. *Gastroenterology* 2012;143:400-7.
- Kim WR, Loomba R, Berg T, Aguilar Schall RE, Yee LJ, Dinh PV, et al. Impact of long-term tenofovir disoproxil fumarate on incidence of hepatocellular carcinoma in patients with chronic hepatitis B. *Cancer* 2015;121:3631-8.
- Tang LS, Covert E, Wilson E, Kottitil S. Chronic hepatitis B infection: A review. *JAMA* 2018;319:1802-13.
- Kim GA, Lim YS, An J, Lee D, Shim JH, Kim KM, et al. HBsAg seroclearance after nucleoside analogue therapy in patients with chronic

- hepatitis B: Clinical outcomes and durability. *Gut* 2014;63:1325-32.
- Shastri K, Chaturvedi G, editors. *Charaka Samhita of Agnivesha, Chikitsa Sthana*. Ch. 16., Ver. 17. 2<sup>nd</sup> ed. Varanasi: Chaukhamba Bharati Academy; 2012. p. 385.
- Gupta AD, editor. *Ashtanga Hridaya of Vagbhata, Nidana Sthana*. Ch. 13., Ver. 53-55. 9<sup>th</sup> ed. Varanasi: Chaukhamba Sanskrit Sansthan; 2012. p. 360.
- Shastri K, Chaturvedi G, editors. *Charaka Samhita of Agnivesha, Siddhi Sthana*. Ch. 1., Ver. 11. 2<sup>nd</sup> ed. Varanasi: Chaukhamba Bharati Academy; 2012. p. 531.
- Gupta AD, editor. *Ashtanga Hridaya of Vagbhata, Nidana Sthana*. Ch. 13., Ver. 17. 9<sup>th</sup> ed. Varanasi: Chaukhamba Sanskrit Sansthan; 2012. p. 355.
- Shastri K, Chaturvedi G, editors. *Charaka Samhita of Agnivesha, Chikitsa Sthana*. Ch. 16., Ver. 34. 2<sup>nd</sup> ed. Varanasi: Chaukhamba Bharati Academy; 2012. p. 491.
- Shastri K, Chaturvedi G, editors. *Charaka Samhita of Agnivesha, Vimana Sthana*. Ch. 5., Ver. 10. 2<sup>nd</sup> ed. Varanasi: Chaukhamba Bharati Academy; 2012. p. 711.
- Shastri K, Chaturvedi G, editors. *Charaka Samhita of Agnivesha, Sutra Sthana*. Ch. 20., Ver. 14. 2<sup>nd</sup> ed. Varanasi: Chaukhamba Bharati Academy; 2012. p. 403.
- Shastri K, Chaturvedi G, editors. *Charaka Samhita of Agnivesha, Sutra Sthana*. Ch. 28., Ver. 12. 2<sup>nd</sup> ed. Varanasi: Chaukhamba Bharati Academy; 2012. p. 571.
- Shastri K, Chaturvedi G, editors. *Charaka Samhita of Agnivesha, Chikitsa Sthana*. Ch. 16., Ver. 40. 2<sup>nd</sup> ed. Varanasi: Chaukhamba Bharati Academy; 2012. p. 491.
- Shastri K, Chaturvedi G, editors. *Charaka Samhita of Agnivesha, Kalpa Sthana*. Ch. 2., Ver. 5. 2<sup>nd</sup> ed. Varanasi: Chaukhamba Bharati Academy; 2012. p. 482.
- Kalaiselvan S, Rasool MK. Triphala herbal extract suppresses inflammatory responses in LPS-stimulated RAW 264.7 macrophages and adjuvant-induced arthritic rats via inhibition of NF-κB pathway. *J Immunotoxicol* 2016;13:509-25.
- Vohora SB, Kumar I, Naqvi S, Afaq SH. Pharmacological investigation on *Picrorhiza kurroa* roots with special reference to its choleric and antimicrobial properties. *Indian J Pharmacol* 1972;34:17-9.
- Khatr A, Garg A, Agrawal SS. Evaluation of hepatoprotective activity of aerial parts of *Tephrosia purpurea* L. and stem bark of *Tecomella undulata*. *J Ethnopharmacol* 2009;122:1-5.
- Yan H, Han LR, Zhang X, Feng JT. Two new anti-TMV active chalconoid analogues from the root of *Phyllanthus emblica*. *Nat Prod Res* 2017;31:2143-8.
- Liu S, Wei W, Li Y, Lin X, Shi K, Cao X, et al. *In vitro* and *in vivo* anti-hepatitis B virus activities of the lignan nirtetralin B isolated from *Phyllanthus niruri* L. *J Ethnopharmacol* 2014;157:62-8.
- Xu M, Zhu HT, Cheng RR, Wang D, Yang CR, Tanaka T, et al. Antioxidant and hyaluronidase inhibitory activities of diverse phenolics in *Phyllanthus emblica*. *Nat Prod Res* 2016;30:2726-9.
- Nworu CS, Akah PA, Okoye FB, Proksch P, Esimone CO. The effects of *Phyllanthus niruri* aqueous extract on the activation of murine lymphocytes and bone marrow-derived macrophages. *Immunol Invest* 2010;39:245-67.
- Tripathi ID, editor. *Rasa Ratna Samuchhya of Rasa Vagbhata*. Ch. 20., Ver. 87-93. 2<sup>nd</sup> ed. Varanasi: Chaukhamba Bharati Academy; 2012. p. 252.
- SarashettiR, S., SimpiC, C., SandeepN, M., and KanthiV, G. Screening of free radical scavenging activity of arogyavardhinivati. *Int J Res Ayurveda Pharm* 2013;4:555-9.