Research Article

www.ijrap.net

CLINICAL EVALUATION OF AYURVEDIC IRON (LAUHA) CONTAINING PREPARATIONS IN IRON DEFICIENCY ANAEMIA

Namrata Joshi^{1*}, Manoj Kumar Dash², L. K Dwivedi³, G. D Khillani⁴

¹Lecturer, P.G Department of Rasashastra and Bhaishajya Kalpana, Rishikul Government Ayurveda College, Haridwar, Uttarakhand, India

²Lecturer, P.G Department of Rasashastra and Bhaishajya Kalpana, Government Ayurveda College Raipur, Chhattisgarh, India

³Department of Rasashastra and Bhaishajya Kalpana, G. J. Patel institute of Ayurvedic Studies and Research, Anand, Gujarat, India

⁴Department of Pharmacology, S.M.S Medical College, Jaipur, Rajasthan, India

Received on: 09/01/15 Revised on: 03/02/15 Accepted on: 02/03/15

*Corresponding author

Dr Namrata Joshi, P.G Dept of Rasashastra & B.K, Rishikul P.G Govt. Ayurveda College, Haridwar-247663 Uttarakhand, India
E-mail: drnamratajoshi@gmail.com

DOI: 10.7897/2277-4343.06246

ABSTRACT

This study was a single blind open non randomized comparative prospective clinical trial as per the ethical guidelines of Declaration of Helsinki. 30 patients of Iron Deficiency Anaemia were included in this study. This study was conducted to evaluate the therapeutic potential of different Iron containing Ayurvedic formulations viz. Lauha bhasma, Navayasa lauha and Lohasava in comparison to ferrous sulphate. The trial was for a period of 6 weeks and assessment was done on the basis of peripheral blood picture, haematological changes as well as changes observed in biochemical parameters viz. Serum Iron and Total Iron binding capacity. The result of the study revealed that all the three iron containing preparations are effective in the correction of Anaemia. Out of all three trial drugs, Navayasa lauha and Lohasava are found effective haemetonic preparations even better than conventional iron therapy. Further, correction of Serum Iron and Total Iron binding capacity is indicative of their direct role on body Iron store

Keywords: Lauha, Iron deficiency anaemia, Hemetonic, Iron Store.

INTRODUCTION

Iron deficiency has been recognized as commonest nutritional deficiency disorder of serious public health significance. Most of the physiological functions of the body deteriorate with Iron deficiency anaemia, thereby disturbing the psychological, developmental, behavioural and work performance in the body. W.H.O. has classified it amongst the top ten-selected health risks¹ and according to W.H.O., 30 % of world's population is anaemic with vast margins in the developing countries, particularly in South Asia and Africa. Ancient seers of Ayurveda were well aware of this clinical condition and named it as Pandu roga. According to Ayurveda, it is a clinical entity where Rakta kshaya (depletion of blood) causes disturbance of dhatvagnivyapaar (metabolic process of the body) resulting in kshaya of Ojas (the essence of life) and development of nutritional disorder presenting with features of deficiency of blood, fat, ojas, looseness of body parts and abnormality of complexion. Based on the principle of Ayurveda substances of like properties will cause increase of the same attributes. According to this principle, Lauha (Iron) can be used in the treatment of Iron deficiency Anaemia, considering it to be the best among haemetonic preparations². Although, Ayurvedic remedies are well established, scientific and time tested; there is always necessity for evaluation of these therapies with modern scientific parameters for their better

acceptance universally. Keeping this view in mind, the present study has been designed to fulfil the following aims and objectives.

- Clinical evaluation of relative supremacy of three different dosage forms of iron as compared to standard modern medicine (Ferrous sulphate) in replenishing Iron deficiency Anaemia.

MATERIALS AND METHODS

Selection of Patients

This study was a single blind open non randomized comparative prospective clinical trial that included 30 clinically diagnosed patients of 'Pandu roga' (Iron deficiency anaemia), of either sex aged between 5-50 years from O.P.D. / I.P.D., of N.I.A. Hospital, Jaipur, Rajasthan, India. Patient distribution study is shown in Table 1. All the medicines were procured from Pharmacy N.I.A, Jaipur, Rajasthan, India. The written and informed consent was obtained from all the patients. In the present study all patients were regularly analyzed and advised to visit the O.P.D. after every week till the end of the trial and the noticeable changes were duly recorded. Laboratory investigations were carried out before commencement and after completion of the treatment. This study was conducted as per the ethical guidelines of Declaration of Helsinki. The study protocol, case report

forms (CRFs), regulatory clearance documents, product related information and informed consent forms (in English and Hindi) were submitted to the institutional ethics committee and were approved by the same. (letter no F.1(4)2/ACA/2003/488).

The criteria for exclusion includes

- Anaemia other than Iron deficiency anaemia.
- Patients with worm infestation.
- Patients with mal absorption syndrome like Ulcerative Colitis, Irritable Bowel Syndrome, and Crohn's Disease etc.
- Pregnant and lactating women.
- Patients with hemorrhagic disorder.
- Haemoglobin percentage below 5 g/dl

The criteria for inclusion includes

Haemoglobin percentage: Below 11 g/dl
Mean corpuscular volume (MCV): Below 76 fl
Serum Iron (SI): Below 40 µg/dl
Total Iron Binding Capacity (TIBC): More than 400 µg/dl

Diagnostic criteria

Subjective symptoms

Classical and modern symptoms like Pandutva (pallor), Pindikodveshtana (pain in Calf muscle), Arohanayasa (shortness of breath), Shopha (edema), Hridrava (palpitation), Arochaka (anorexia), Shrama (fatigue), Jihwa Varnata (Tongue changes), Gatra-shula (Body ache), Shira-shula (Headache) Daurbalya (Weakness), Kopa (Irritability), Bhrama (Giddiness), Artava chakra vika (Change in menstrual cycle) were included in this study.

Laboratory findings

- Peripheral blood film
- Haematological parameters viz. haemoglobin (Hb %), Total leucocyte count (T.L.C.), Differential leucocyte count (D.L.C.), Total red blood cell count (T.R.B.C.), Packed cell volume (P.C.V.), Mean corpuscular volume (M.C.V.), Mean corpuscular haemoglobin concentration (M.C.H.C), Mean corpuscular haemoglobin (M.C.H.)
- Biochemical parameters i.e. Serum Iron and Serum Total iron binding capacity (T.I.B.C.)

Follow up study

All patients were regularly analyzed after every week till the end of the trial and the notable changes were duly recorded. Laboratory investigations were carried out before commencement and after completion of the treatment.

Statistical analysis

Paired 't' test was applied to evaluate the significance at different levels. The obtained results were interpreted as Insignificant result $p > 0.10$, Significant result $p < 0.05$, $p < 0.02$, $p < 0.01$ and highly significant result $p < 0.001$.

Subjective Assessment

The patients undergoing the treatment were assessed on the basis of improvement in specific symptomatology of Pandu roga on the basis of symptom rating score depicted below. Further grading was done in accordance with their incidence of severity as

- Nil = 0 % = -
- Mild = 25 % = +
- Moderate = 50 % = ++
- Severe = 75 % = +++
- Agonizing = 100 % = ++++

Drug

Iron containing three Ayurvedic formulations viz. Lauha bhasma, Navayasa lauha and Lohasava as shown in Table 2, were trailed used as trial in comparison with ferrous sulphate capsule. Posology of the study is shown in Table 3.

OBSERVATION AND RESULT

Subjective Parameters

All the patients were investigated before and after treatment with subjective symptoms, haematological and biochemical parameters. With regard to the subjective symptoms of the four groups studied, the control group was found highly significant in improving only one symptom i.e. Pandutva (50.00 %), however symptoms like Shwasa (41.67 %), Shrama (50 %), Gatra shula (40 %), Daurbalaya (38.89 %), Bhrama (30.77 %), Shopha (50 %) and Pindikodweshtana (47.83 %) were relieved up to significant level. Similarly none of the symptoms were relieved to highly significant level in the group treated with Lauha bhasma, although it was found to be significantly effective in relieving symptoms like Pandutava (55.5 %), Shwasa (33.33 %), Hridspandan (27.78 %), Shrama (45.00 %), Gatra shula (34.7 %), Daurbalya (41.6 %), Bhrama (33.33 %), Pindikodweshtana (52.63 %), Shopha (33.77 %), Arochaka (41.18 %) and Shira shula (40.00 %). Further, the other two trial drugs i.e. groups treated with Navayasa lauha and Lohasava run parallel in relieving subjective symptoms with highly significant improvement in the symptom of Pandutva (58.33 %, 50.00 %), Shrama (68.18 %, 73.68 %), Gatra shula (70.00 %, 65.00 %), Daurbalya (60.87 %, 56.52 %) and Arochaka (76.47 %, 78.95 %) whereas significant improvement was observed in the symptoms of Shwasa (73.33 %, 76.47 %), Pindikodweshtana (57.89 %, 55.00 %) Shirashula (55.56 %, 46.67 %), Irritability (25 %, 30.77 %) and Change observed in tongue (38.46 %, 30.77 %). Moreover in correction of symptoms of Hridspandan (52.94 %), Bhrama (64.71 %)

and Shopha (70.00 %), Lohasava exert highly significant relief which with Navayasa lauha was found to be significant (40.00 %; 50.00 %; and 47.06 % respectively) whereas in relieving Menstrual abnormalities Navayasa lauha showed highly significant relief (81.25 %) which was found to be significant (64.29 %) with group treated with Lohasava. Among these two drugs, the symptom of Shwasa, Hritspandan, Shrama, Bhrama, Shopha Arochaka, Tongue changes and Irritability were better relieved with Lohasava whereas improvement in symptoms like Pandutva, Gatrashula, Daurbalya, Pindikodweshtana, Shirashula, Changes in menstrual cycle were more pronounced with Navayasa lauha treated group. If the effect of different trial drugs on subjective symptoms is summarized it can be inferred that Navayasa lauha and Lohasava are better remedy in treating the disease condition even better than the conventional ferrous sulphate (N.L.: L-1 ↑↑ v/s ferrous sulphate: 55.44 %; 54.54 % v/s 35.00 %). Further, among these two preparations though number of symptoms were maximally relieved in the later formulation, Navayasa lauha still imparts better result statistically though very minutely (N.L. ↑↑ v/s L-1 ↑). Among all trial groups, group-‘A’ treated with Lauha bhasma impart least response as a whole. (33.57 %) (Table 4)

Haematological parameters

Following changes have been noticed on analyzing the statistical data regarding the Haematological parameters in the entire four groups. Control group (ferrous sulphate group) showed highly significant improvement in Hb % (17.05 %), P.C.V. (24.21 %); significant improvement in T.R.B.C. (10.98 %) and M.C.V. (12.04 %), whereas improvement was insignificant in M.C.H., M.C.H.C. In contrast to control group, group-‘B’ and group-‘C’ have revealed highly significant improvement in Hb % (29.25 % and 13.50 %), M.C.V. (17.7 %, 12.0 %); significant improvement in M.C.H. (15.95 %, 7.91 %). whereas highly significant improvement was noticed in T.R.B.C. (12.05 %) and P.C.V. (32.08 %) in group-‘B’ which was seen to be significant in group-‘C’ (5.21 %, 17.71 %). Group-‘A’ has shown significant improvement in Hb % (6.81 %), MCV (3.02 %), PCV (3.75 %) and improvement was non-significant in T.R.B.C., M.C.H. and M.C.H.C. In total, these findings are suggestive of least improvement offered by Lauha bhasma as compared to other two trial drugs i.e. Navayasa lauha and Lohasava. Moreover, among Navayasa lauha and Lohasava, former drug was found to impart maximum improvement even better than conventional ferrous sulphate therapy (NL (↑↑↑) v/s control group (↑↑) v/s L₁ (↑) as evident by better relief in Hb % (29.25 %) v/s 17.05 v/s 13.50 %) T.R.B.C. (12.05 % v/s 10.98 %, 5.21 %), P.C.V. (32.08 % v/s 24.21 %, v/s 17.71 %), M.C.V. (17.78 % v/s 12.04 v/s 12.04 %); With regard to change observed in M.C.H., Navayasa lauha still assumes the top rank (15.9 %), whereas Lohasava improves it in a better way than control group (L-1 v/s F.S.-7.91 % v/s 5.03 %). Among all the trial groups, non significant improvement was observed in M.C.H.C. level in spite of other relevant changes as shown in Table 5.

Biochemical Parameters

Serum Iron and serum T.I.B.C. improved to a significant level in all the four groups except serum Iron level in group-‘A’. Maximum improvement was seen in group-‘C’ (28.00 %, 11.23 %) followed by group-‘B’ (22.41 %, 6.69 %) and control group (12.31 %, 4.03 %) as clearly evident from Table 6. Thus except Lauha bhasma other two drugs impart even greater bio-availability of iron. As compared to the control group (Lohasava ↑, Navayasa lauha v/s control group ↑)

DISCUSSION

In the present study it was observed that Navayasa lauha and Lohasava are better than Lauha bhasma and even conventional Iron therapy in the correction of iron deficiency. Further it was also observed that out of these two drugs, some of the features are better corrected by Navayasa lauha like Pandutva, Pindikodweshtana (P.C.M), Daurbalya (weakness), Gatrashool (Bodyache), Shirashula and Menstrual disturbances whereas Lohasava was found to be more effective in correction of Shwasa (Shortness of breath), Hritspandan (Palpitation), Shrama (Fatigue), Shopha (Edema), Arochaka (Loss of Appetite) and tongue change.

Probable mode of drug action of navayasa lauha and lohasava with probable reason of better efficacy with navayasa lauha can be summarized as under

In the present study Navayasa lauha, a haematinic herbomineral preparation produced good effect to increase the haemoglobin percentage in comparison to Lohasava group. This suggests that Navayasa lauha³⁻⁸ possibly increase the Hb concentration by replenishing iron deficiency. Pindikodweshtana (P.C.M), Daurbalya (weakness) and Gatrashool (Bodyache) in iron deficiency anaemia is due to the increase in hypoxia which results in retention of lactic acid. When the above retention occurs, there is decrease in work capacity and endurance. It results in agni vaisamya. Agni vaisamya leads to vata vridhi and oja kshya and ultimately Dhatu shaithilya. It is clear that Navayasa lauha proved to be of great value in improving the above symptomatology of the patients. There was a feeling of well-being and decrease in body ache, disappearance of Pindikodweshtana in patients of Iron deficiency anaemia. This was manifested by the improvement of liver function by Tridosahara^{12,13}, Rasayana^{12,13,4,7-9}, Vatanulomaka^{12,13,5,6} and/or direct anabolic action with Shulahara property⁵⁻¹¹, thereby improving the nutrition status of the subjects. This above property stimulates the circulation which decreases the lactic acid accumulation. This suggests that the drug Navayasa lauha increased the Hb % and other indices which automatically increased the oxygen supply throughout the body by which tissue hypoxia decreased. This influences the Rasadi dhatu to correct its Poshana, Deepana and Vatanulomana action. When the above pharmacodynamic effect has occurred it results in ojavridhi by the virtue of which vata shaman occurs. The symptoms like menstrual disturbances were significantly

changed in Navayasa lauha group in comparison to Lohasava group. The pathogenesis behind the menstrual disturbances in iron deficiency anaemia patients is due to excessive blood loss, hormonal imbalance which results in decreased blood flow. It results in Dhatu Dushti that ultimately leads to Rasakshaya. Due to Rasakshaya there was affection on upadhatu (Artava). Menstrual disturbances are the commonest cause of iron deficiency anaemia and low haemoglobin concentration may predict objectively menstrual loss. There was a significant rise in the mean Hb % level at the end of the therapy in Navayasa lauha group in comparison to Lohasava group. Medical treatment can be conveniently divided into nonhormonal and hormonal therapy for menstrual disturbances in iron deficiency anaemia. The two main first line treatments for menstrual disturbances in iron deficiency anaemia are associated with ovulatory cycles are non-hormonal. Navayasa lauha has been well proven to regularise the menstrual disturbances because there was a significant rise in the mean Hb % level at the end of the therapy as compared to baseline. Navayasa lauha ingredients contains properties like Deepana⁵⁻¹³ Pachana^{5-8,10,11,14-16} which directly stimulate the nervous system, may produce an oestrogen like activity that enhances the repair of endometrium by balancing the hormones. Navayasa lauha has been found to be beneficial in the treatment of menstrual disturbances due to anemia and general weakness that are common manifestations of Iron deficiency anaemia.

Probable mode of Drug action of Navayasa lauha and Lohasava with probable reason of better efficacy with Lohasava can be summarized as under

Clinical trial data on Lohasava is indicative of its statistically significant efficacy in Shwasa. Lohasava increases the Hb % and red cell indices which facilitates more oxygen supply to alveolar cells and may reduces Vata. It has an Rasadhatu vridhhi like activity and helps in improving Agni by its Katu Rasa^{5,6,9} Laghu Guna, Ushna veerya⁵⁻⁹, property. Possibly due to Agnivridhhi, proper Dhatu Paka occurs. The ingredients of Lohasava may work synergistically to increase the oja dhatu which ultimately relieves shwasa. Lohasava controls the symptom of Hritspandan in better way. Asava itself improves the cardiac function¹⁷ and reduce the cardiac volume. Lohasava regulates the proper formation of Rasa dhatu. There was a statistically significant improvement in shrama (Fatigue) in Lohasava group. Fatigue in iron deficiency anaemia is due to the hypodynamic circulation which ultimately results Rasa kshya. Lohasava¹⁸ ingredients facilitate proper formation and distribution of Rasadhatu. On an overall Lohasava ingredients permeate the micro channels in a better way. Lohasava on its effect on shrama lead to a remarkable feeling of well-being and patients regained their confidence to resume their usual activities. With advancement of iron deficiency anaemia, most of the patients experience Bhrama (giddiness). This is because of increase in blood volume which decreases the oxygen delivery to the brain results in Rasa Rakta Sroto Vikara. Lohasava could bring about an improvement in Bhrama in comparison to Navayasa lauha

group because it permeates the micro channels (srotos) in a better way. Lohasava overcomes the Bhrama and promotes natural restful sleep. The beneficial action of Lohasava in comparison Navayasa lauha might be due to the synergistic actions of its ingredients. Lohasava maintains the fluid balance due to its mutual action. Lohasava enhances the micro circulation¹⁹ (Quick action of Srotos) which symptomatically relieves Shopha. Shopha is due to the reduction in Hb % which decreases the T.R.B.C that results in reduced osmotic pressure. Statistical analysis of the clinical characteristics and overall impression supports the view that the group receiving Lohasava had significantly better clinical and functional results in Shopha than those receiving Navayasa lauha although both the groups had significant improvement in the clinical and functional condition. In iron deficiency anaemia a number of hypothesis have been proposed to explain the pathogenesis of Arochaka. This is because of papillary atrophy of tongue which results in tastelessness. The drug seems to have some regeneration effect of papillary epithelium because of the Rochana²⁰ Pachana property. It proved out to be an effective and well tolerated drug in the management of Arochaka in iron deficiency anaemia. Further, in correction of haematological features Navayasa lauha imparts better result whereas on the other hand Lohasava directly acts upon the body stores of iron thus replenishes biochemical parameters in better way owing to the presence of alcohol that causes better absorption capacity of iron in ferric form²¹. It is worthy to note that although the trial drugs exert significant effect on hematological parameters like Hb %, P.C.V., M.C.V., T.R.B.C., M.C.H. but non-significant with respect to M.C.H.C. Since MCH is indicative of concentration of haemoglobin per red cell²² where as MCHC denotes concentration of haemoglobin over whole of the blood i.e.²³ PCV. Thus, if Hb % rises and PCV rises the ratio i.e. MCHC may not change level inspite of correction of the parameter, whereas MCH indicates absorption of Hb per red cell. Thus if a preparation increase MCH, that means the Hb content of individual cell is increased and it may not necessary reflect in MCHC in spite of correction of Anaemia. T.I.B.C. is an indicator of the extent of prevailing iron deficiency in an individual, therefore, if any therapy reduces T.I.B.C. It is indicative of the correction of the underlying cause. Greater the reduction in T.I.B.C²⁴ better is the response. The result of present study shows that at the end of 1½ months of observation maximum result was obtained with Lohasava, indicative of better bioavailability of iron. Thus Lohasava shows a distinct advantage over other two preparations and so also over conventional iron therapy. A fortuitous observation of the present work is the change in menstrual irregularities in form of either delayed or excess menstruation which was corrected by administration of Navayasa lauha and Lohasava, (N.L. ↑↑ v/s L-1). It is incorrect to state that correction of Anaemia per say improves menstrual irregularities; therefore some ingredients of these two preparations may be responsible in regulating the menstrual abnormalities. The composition of any formulation depends on two major criteria's

Table 1: Group wise distribution of patients registered for the study

Group	Completed	LAMA	Total
Control-F.S	07	00	07
A-L.B	08	03	11
B-N.L	08	00	08
C-L.A	07	01	08

Note – L.A.M.A. -Left against Medical Advice, F.S=Ferrous sulphate, L.B= Lauha bhasma, N.L= Navayasa lauha, L.A= Lohasava

Table 2: Constituent ingredients of Lauha bhasma, Navayasa lauha and Lohasava

S. No.	Drug	Scientific Name	Part Used	Name of the formulation**		
				Lauha bhasma *	Lohasava	Navayasa lauha
1.	Lauha bhasma	-	-	-	✓	✓
2.	Pippali	<i>Piper longum</i> Linn.	Fr.	-	✓	✓
3.	Maricha	<i>Piper nigrum</i> Linn.	Fr.	-	✓	✓
4.	Shunthi	<i>Zingiber officinale</i> Rose.	Rz.	-	✓	✓
5.	Haritaki	<i>Terminalia chebula</i> Retz.	P.	✓	✓	✓
6.	Bibhitaka	<i>Terminalia bellerica</i> Roxb.	P.	✓	✓	✓
7.	Amalaki	<i>Embelica officinalis</i> Gaertn.	P.	✓	✓	✓
8.	Mustaka	<i>Cyperus rotundus</i> Linn.	Rz.	-	✓	✓
9.	Vidanga	<i>Embelia ribes</i> Burm F.	Fr.	-	✓	✓
10.	Chitraka	<i>Plumbago zeylanica</i> Linn.	Rt.	-	✓	✓
11.	Yavani	<i>Trachyspermum ammi</i> Linn.	Fr.	-	✓	-
12.	Dhataki	<i>Woodfordia fruticosa</i> (Linn.)	Fl.	-	✓	-
13.	Madhu	<i>Apies dorsata</i>	-	-	✓	-
14.	Guda	<i>Saccharum officinarum</i>	St.	-	✓	-

*Decoction of Triphala was used in levigation process during the preparation of Lauha bhasma

**Formulations mentioned in A.F.I. part-I are followed in the present study

Table 3: Posology

Group	Drugs Administered	Dose	Vehicle	Time of Administration	Duration of the treatment
Control	Ferrous sulphate	1 cap (65 mg. of elemental iron)	Water	Morning, Evening {empty stomach}	6 weeks
A	Lauha bhasma	1cap. (125 mg.)	Madhu + Ghrita	Morning, Evening {empty stomach}	6 weeks
B	Navayasa lauha	1cap. (250 mg.)	Madhu + Ghrita	Morning, Evening {Empty stomach}	6 weeks
C	Lohasava	25 ml	water	After meals	6 weeks

Table 4: Changes in subjective parameters

S. No	Parameter	Control group			Group A			Group B			Group C		
		Relief %	't'	'p'	Relief %	't'	'p'	Relief %	't'	'p'	Relief %	't'	'p'
1.	Pandutva (Pallor)	50.00	6.97	< 0.001***	33.33	5.29	< 0.01**	58.33	7.00	< 0.001***	50.00	7.78	< 0.001***
2.	Shwasa (Shortness of breath)	41.67	3.16	< 0.02**	55.56	4.80	< 0.01**	73.33	5.28	< 0.01**	76.47	7.05	< 0.01**
3.	Hritspandan (Palpitation)	22.00	1.73	< 0.10*	27.78	2.50	< 0.05**	40.00	3.29	< 0.02**	52.94	6.71	< 0.01**
4.	Shrama (Fatigue)	50.00	4.38	< 0.01**	45.00	4.97	< 0.01**	68.18	8.28	< 0.001***	73.68	6.48	< 0.001***
5.	Gatrashula (Body ache)	40.00	3.29	< 0.02**	34.78	5.29	< 0.01**	70.00	10.69	< 0.001***	65.00	7.12	< 0.001***
6.	Daurbalya (Weakness)	38.89	4.58	< 0.01**	41.67	5.00	< 0.01**	60.87	7.00	< 0.001***	56.52	7.12	< 0.001***
7.	Bhrama (Giddiness)	30.77	3.16	< 0.05**	33.33	3.83	< 0.01**	50.00	5.00	< 0.01**	64.71	7.78	< 0.001***
8.	Pindikodweshtana (P.C.M.)	47.83	5.28	< 0.01**	52.63	4.80	< 0.01**	57.89	5.23	< 0.01**	55.00	5.28	< 0.01**
9.	Shopha (Edema)	50.00	3.87	< 0.02**	30.77	3.16	< 0.05**	47.06	4.38	< 0.01**	70.00	6.48	< 0.001***
10.	Arochacka (Anorexia)	14.29	1.55	< 0.10*	41.18	3.86	< 0.01**	76.47	8.88	< 0.001***	78.95	8.22	< 0.001***
11.	Tongue Changes	22.22	1.63	< 0.10*	33.33	1.73	< 0.10*	30.77	4.0	< 0.01**	38.46	2.71	< 0.05**
12.	Shira-shula (Headache)	33.33	1.73	< 0.10*	40.00	3.29	< 0.02**	55.56	5.00	< 0.05**	46.67	4.58	< 0.01**
13.	Kopa (Irritability)	14.29	1.58	< 0.10*	17.65	2.05	< 0.10*	25.00	2.50	< 0.05**	30.77	3.16	< 0.05**
14.	Menstrual cycle	12.50	1.00	< 0.10*	20.00	1.63	< 0.10*	81.25	9.00	< 0.001***	64.29	5.40	< 0.01**

Note: *= Non Significant, **= Significant, ***= Highly-Significant

Table 5: Changes in Hematological Parameters

S. No.	Parameter	Control group			Group A			Group B			Group C		
		Relief %	't'	'p'	Relief %	't'	'p'	Relief %	't'	'p'	Relief %	't'	'p'
1.	Hb %	17.05	6.30	< 0.001 ***	6.81	3.64	< 0.01 **	29.25	9.52	< 0.001 ***	13.50	9.47	< 0.001 ***
2.	T.R.B.C.	10.98	3.64	< 0.01 **	0.84	1.74	< 0.10 *	12.05	6.78	< 0.001 ***	5.21	3.96	< 0.01 **
3.	T.L.C.	0.54	0.15	< 0.10 *	0.38	0.10	< 0.10 *	0.96	0.18	< 0.10 *	6.78	1.32	< 0.10 *
4.	P.C.V.	24.21	6.35	< 0.001 ***	3.75	2.95	< 0.05 **	32.08	7.59	< 0.001 ***	17.71	4.92	< 0.01 **
5.	M.C.V.	12.04	3.20	< 0.02 **	3.02	2.49	< 0.05 **	17.78	5.81	< 0.001 ***	12.04	6.93	< 0.001 ***
6.	M.C.H.	5.03	1.29	< 0.10 *	3.73	1.27	< 0.10 *	15.95	4.67	< 0.01 **	7.91	2.89	< 0.05 **
7.	M.C.H.C.	6.70	1.85	< 0.10 *	4.99	1.46	< 0.10 *	1.36	0.36	< 0.10 *	3.42	1.93	< 0.10 *

Note: * = Non Significant, ** = Significant, *** = Highly-Significant

Table 6: Changes in Biochemical Parameters

S. No.	Parameter	Control group			Group-A			Group-B			Group-C		
		Relief %	't'	'p'	Relief %	't'	'p'	Relief %	't'	'p'	Relief %	't'	'p'
1.	S. Iron	12.31	4.38	0.01 **	3.13	0.80	0.10 *	22.41	5.02	0.01 **	28.00	4.58	0.01 **
2.	T.I.B.C.	4.03	4.38	0.01 **	3.28	3.21	0.01 **	6.69	3.55	0.01 **	11.23	3.78	0.01 **

Note: * = Non Significant, ** = Significant, *** = Highly-Significant

Table 7: Summary of changes observed in the subjective parameters

S. No.	Symptom	Group			
		Control	A	B	C
1.	Pandutva (Pallor)	H.S (50.00 %)	S (33.33 %)	H.S (58.33 %)	H.S (50.00 %)
2.	Shwasa (Shortness of breath)	S. (41.67 %)	S (55.56 %)	S. (73.33 %)	H.S. (76.47 %)
3.	Hritspandan (Palpitation)	N.S. (22.00 %)	S (27.78 %)	S (40.00 %)	S (52.94 %)
4.	Srama (Fatigue)	S (50.00 %)	S (45.00 %)	H.S. (68.18 %)	H.S. (73.68 %)
5.	Gatrashula (Body ache)	S. (40.00 %)	S (34.78 %)	H.S. (70.00 %)	H.S. (65.00 %)
6.	Daurbalya (Weakness)	S (38.89 %)	S (41.67 %)	H.S. (60.87 %)	H.S. (56.52 %)
7.	Bhrama (Giddiness)	S (30.77 %)	S (33.33 %)	S (50.00 %)	H.S. (64.71 %)
8.	Pindikodweshatana (P.C.M.)	S (47.83 %)	S (52.63 %)	S (57.89 %)	S (55.00 %)
9.	Shopha (Edema)	S (50.00 %)	S (30.77 %)	S (47.06 %)	H.S. (70.00 %)
10.	Arochacka (Anorexia)	N.S (14.29 %)	S (41.18 %)	H.S. (76.47 %)	H.S. (78.95 %)
11.	Tongue Changes	N.S. (22.22 %)	N.S. (33.33 %)	S (30.77 %)	S (38.46 %)
12.	Shira-shula (Headache)	N.S. (33.33 %)	S (40.00 %)	S (55.56 %)	S (46.67 %)
13.	Kopa (Irritability)	N.S. (14.29 %)	N.S. (17.65 %)	S (25.00 %)	S (30.77 %)
14.	Menstrual cycle	N.S. (12.50 %)	N.S. (20.00 %)	H.S. (81.25 %)	S. (64.29 %)

Table 8: Summary of changes observed in the laboratory parameters

Parameter	Control	A	B	C
Hb %	H.S. (17.05 %)	S (6.81 %)	H.S. (29.25 %)	H.S. (13.50 %)
TRBC	S (10.98 %)	N.S.	H.S. (12.05 %)	S (5.21 %)
TLC	N.S.	N.S.	N.S.	N.S.
PCV	HS (24.21 %)	S (3.75 %)	H.S. (32.08 %)	S (17.71 %)
MCV	S (12.04 %)	S (3.02 %)	H.S. (17.78 %)	H.S. (12.04 %)
MCH	N.S. (5.03 %)	N.S.	S (15.95 %)	S (7.91 %)
MCHC	N.S.	N.S.	N.S.	N.S.
Serum Iron	S (12.31 %)	N.S.	S (22.41 %)	S (28.00 %)
Serum TIBC	S (4.03 %)	S (3.28 %)	S (6.69 %)	S (11.23 %)

Chief constituent

Supporting constituent

- Drug that support the chief ingredient in its action.
- Drug that eradicate the toxicity of the formulation.
- Drugs providing media for easy transport and bioavailability in the body i.e. vehicle.

The chief constituent (drug) in all the three formulations is Lauha bhasma with well known haematinic potential based on the principle- Drugs like Trikatu, Trimada, Yavani, are well known to possess Deepana (stomachic),

Pachana (digestive), Rochana (appetizer), Kriminasaka (anti-helminthic), Shulahara (analgesic), Hridya (cardiac tonic), Panduhara (haematinic) properties and act as adjuvant drug in Navayasa lauha and Lohasava.

- Drug possessing an Anulomana property like Triphala and Yavani counteract the constipative effect of Lauha. Similarly drugs like Trikatu, Vidanga, Triphala, Musta, Madhu and Ghrita aid in removing the metallic characters of lauha owing to their

Vishagna (anti toxic) and Giridoshahara properties, thus removing ill effects of Lauha.

- Madhu and Ghrita given as Anupana (vehicle) in case of Navayasa lauha bring about quick action due to their Yogavahi (super-advenient) property. Further water taken as anupana in case of Lohasava reduces the irritant effect of it and increases the bioavailability of the formulation i.e. abnormal function of Agni (digestive power) is the root cause of all diseases. Based on this fact the constituent drug helps in breaking the pathogenesis of the Pandu roga²⁵ (I.D.A.).

CONCLUSION

Clinical study shows haematinic potential of all three iron containing drugs at varying level with better results of Navayasa lauha and Lohasava in correcting the underlying pathology even better than the conventional modern therapy with ferrous sulphate. Further, overall improvement of Navayasa lauha was found to be a little more than Lohasava with better results in correction of Haematological parameters whereas on the other hand Lohasava was observed to directly affect the body stores of iron. Thus for an iron deficiency patient, this preparation is immortal in replenishing the disease condition and thus can manage to provide a long term relief. Lohasava shows a distinct advantage over other two preparations and so also over conventional iron therapy in terms of replenishing iron stores of body. Unlike, the conventional therapy all the three Ayurvedic haematinic preparations did not impart any side effects. Thus, claiming these medicines to be safe for internal application. With a fortuitous observation noticed in respect to correction in menstrual irregularities by administration of Navayasa lauha and Lohasava, it can be presumed that some ingredients of these two preparations may act upon the hormonal level and thereby regulates the menstrual abnormalities.

REFERENCES

1. World Health Organization .Iron Deficiency Anaemia Assessment, Prevention and Control. Geneva.
2. Vagbhata, Ashtanga Hridaya by Kaviraj Atridev Gupta and Yadunandan Upadhyaya. Uttara sthana chapter 40/49,13thed, Chaukhamba Sanskrit Samsthan, Varanasi; 1997. p. 343.
3. Fauci, Braunwald, Kasper. Harrison's principle of Internal Medicine.17th ed., Tata Mcgraw-hill publishing company limited; 2008. p. 2092.
4. Anonymous. Ayurvedic Pharmacopoeia of India. 1sted., vol. 3, part 1. Government of India, Ministry of Health and Family Welfare; 2001. p. 103-4.
5. Sri Bhavamisra, Bhav Prakash Nighantu, Revised edition, Hindi Commentary by Dr KC Chuneekar. Vol. 18, Haritakyadi/44-48, Chaukhamba Bharati Academy; Varanasi; 2004. p. 13.
6. Anonymous. Ayurvedic Pharmacopoeia of India. 1st ed., vol. 3, part 1. Government of India, Ministry of Health and Family Welfare; 2001. p. 29.
7. Sri Bhavamisra, Bhav Prakash Nighantu, Revised edition, Hindi Commentary by Dr KC Chuneekar. Vol. 18, Haritakyadi/70-71, Chaukhamba Bharati Academy; Varanasi; 2004. p. 24.
8. Sri Bhavamisra, Bhav Prakash Nighantu, Revised edition, Hindi Commentary by Dr KC Chuneekar. Vol. 18, Haritakyadi/55-58, Chaukhamba Bharati Academy; Varanasi; 2004. p. 15.
9. Anonymous. Ayurvedic Pharmacopoeia of India. 1st ed., vol. 3, part 1. Government of India, Ministry of Health and Family Welfare; 2001. p. 11.
10. Sri Bhavamisra, Bhav Prakash Nighantu, Revised edition, Hindi Commentary by Dr KC Chuneekar. Vol. 18, Haritakyadi/59-60, Chaukhamba Bharati Academy; Varanasi; 2004. p. 17.
11. Anonymous. Ayurvedic Pharmacopoeia of India. 1st ed., vol. 1, part 1. Government of India, Ministry of Health and Family Welfare; 2001. p. 48.
12. Sri Bhavamisra, Bhav Prakash Nighantu, Revised edition, Hindi Commentary by Dr KC Chuneekar. Vol. 18, Haritakyadi/20-26, Chaukhamba Bharati Academy; Varanasi; 2004. p. 5.
13. Anonymous. Ayurvedic Pharmacopoeia of India. 1st ed., vol. 3, part 1. Government of India, Ministry of Health and Family Welfare; 2001. p. 130.
14. Sri Bhavamisra, Bhav Prakash Nighantu, Revised edition, Hindi Commentary by Dr KC Chuneekar. Vol. 18, karpuradi/92-98, Chaukhamba Bharati Academy; Varanasi; 2004. p. 243.
15. Anonymous. Ayurvedic Pharmacopoeia of India. 1st ed., vol. 1, part 1. Government of India, Ministry of Health and Family Welfare; 2001. p. 123.
16. Vagbhata, Ashtanga Hridaya by Kaviraj Atridev Gupta, sutra sthana, chapter 30/49,13thed, Chaukhamba Sanskrit Samsthan, Varanasi; 2005. p. 331.
17. Agnivesha, Charaka Samhita, Vol 1, Sutra Sthana, 25/40, Choukhambha Sanskrit Sansthaan, Varanasi; 1995. p. 469.
18. Sujit K Choudhary, Concise Medical Physiology, New Central Book Agency Ltd, 7thed Calcutta. India; 1996. p. 28.
19. Agnivesha, Charaka Samhita, Vol 1, Sutra Sthana, 17/26, Choukhambha Sanskrit Sansthaan, Varanasi; 1995. p. 513.
20. Neander G and Vahlquist B. Studies on absorption of Iron: II, Experimental studies on serum Iron level, Aeta, Phsiol, published by The Army Medical Library 1949; 17(97): 67.
21. Hallberg *et al*, Advances in immunology, 5thed, Vol, published by Academic Press; 1976; 25(96): 173.
22. Charlton RW, Jacobs P, Refel H, Bothwell TH. Effect on Iron absorption Br. Med. J 22:1427-9 1990; 54: 124.
23. Basic factors of Pharmacology by Steward M Brooks, Vol. 6th; 1974. p. 240.
24. Vagbhata, Ashtanga Hridaya by Kaviraj Atridev Gupta, Sutra Sthana, chapter 40/49, 13thed, Chaukhamba Sanskrit Samsthan, Varanasi; 2005. p. 331.
25. G Ramadevi, S Jonah, UN Prasad. A clinical study on the effect of Dhatri Lauha in Garbhini Pandu (iron deficiency anaemia). Int. J. Res. Ayurveda Pharm 2014; 5(6): 708-712. <http://dx.doi.org/10.7897/2277-4343.056143>

Cite this article as:

Namrata Joshi, Manoj Kumar Dash, L. K Dwivedi, G. D Khillani. Clinical evaluation of Ayurvedic iron (lauha) containing preparations in iron deficiency anaemia. Int. J. Res. Ayurveda Pharm. 2015;6(2):225-231 <http://dx.doi.org/10.7897/2277-4343.06246>

Source of support: Nil, Conflict of interest: None Declared