SCIENTIFIC EVALUATION OF SOME AYURVEDIC PREPARATIONS FOR CORRECTION OF IRON DEFICIENCY AND ANEMIA

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ABSTRACT

A number of preparations are available in Ayurved for treatment of anemia and iron deficiency. This study was designed to evaluate efficacy of some of them. Six most commonly used Ayurvedic iron containing preparations (Navayasa Curna, Punarnavadi Mandura, Dhatri Lauha, Pradarantaka Lauha, Sarva-Juara-Hara Lauha and Vrihat Yakrdari Lauha) were given in a dose of 250 mg b.d. for 30 days to six groups of iron deficient anemic patients; each group consisting of 20 patients. A control group was given Allopathic preparation - Irex-12, (containing - ferrous fumarate, vitamin C, folic acid and vitamin B₁₂); 1 capsule daily for 30 days for comparison. All hematological and iron parameters were determined before and after completion of treatment. The results showed that there was statistically significant rise ($p < 0.001$) in all of them - Hb, PCV, TRBC, MCV, MCH, MCHC and plasma iron, percent saturation and plasma ferritin. Total iron binding capacity decreased significantly ($p < 0.001$). The response of most of Ayurvedic preparations was better than Allopathic preparation and there was no side effect as observed with iron salts. The Hb regeneration rate was 0.10 g/dl/day for Allopathic preparation; while it was above this value for all Ayurvedic preparations except Pradarantaka Lauha which was least effective. Sarva-Juara-Hara Lauha was the drug of choice as Hb regeneration with it was highest 0.16 g/dl/day. Upon analysis of Ayurvedic drugs, these results were found to be consistent and correlated with iron content of the preparation.

KEY WORDS

Ayurvedic preparations, Iron deficiency, Anemia, Hematological parameters, Iron parameters.

INTRODUCTION

Iron deficiency and consequent anemia (IDA) has a very high global incidence (1). It poses serious health problems because it causes general weakness, lethargy, lassitude, sub-optimal work performance and in certain situations mental retardation, poor intelligence and abnormal immune response (2).

Innumerable iron containing allopathic formulations are available in the market for treatment of iron deficiency anemia (3). They contain one or the other iron salt, like, ferrous

sulphate, ferrous fumarate, ferrous glycine sulfate, ferric hydroxide polymaltose complex, ferric ammonium citrate, iron dextran, iron choline citrate, iron sorbitol citrate, ferrous calcium citrate, ferrous gluconate, colloidal iron hydroxide, ferrous succinate and ferric hydroxide (4).

The long term treatment with iron salts is associated with several side effects, like, heartburn, nausea, upper gastric discomfort, constipation and diarrhoea (4). Recently it has been shown to generate damaging free radicals in the intestine (5).

An alternative approach of therapy is to enhance the absorption of dietary iron, rather than increase iron in the diet. A variety of such substances have been marketed, viz. surface acting agents, carbohydrates, inorganic salts, amino acids and ascorbic acid. None of these have become popular, although ascorbic acid seems to be promising (6).

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Despite the availability of the large number of iron salts and preparations for correction of anemia and iron deficiency, the need of a better preparation has always been felt. The present study is one such step in this direction.

The Indian system of medicine - Ayurveda, also offers a large number of iron preparations which have been used for centuries (7). Some of them are - *Agnimukha Lauha*, *Amalapittantako Lauha*, *Chandanadi Lauha*, *Chinnakadi Lauha*, *Dhatri Lauha*, *Guduchyadi Lauha*, *Jaya Mangala Rasa*, *Kamlantaka Rasa*, *Lauha Mritam*, *Lauhagudika*, *Lauhasva*, *Mahamrityunjaya Lauha*, *Mahasvasari Lauha*, *Navayasa Curna*, *Pippaladhya Lauha*, *Pittantaka Lauha*, *Pradarantaka Lauha*, *Pradarari Lauha*, *Punarnavadi Mandura*, *Rohitaka Lauha*, *Saptamrata Lauha*, *Sarva-Juara-Hara Lauha*, *Sarveshwara Lauha*, *Shakra Lauha*, *Shulraj Lauha*, *Sudhanidhi Rasa*, *Triphala Lauha*, *Vatapittantako Rasa*, *Vataraktantako Rasa*, *Vrihat Yakrdari Lauha* and *Yakrdari Lauha* (8). However, the scientific study of their efficacy as hematinic has not been carried out. The aim of the present study was precisely the same.

MATERIALS AND METHODS

This study was conducted on 140 adult patients (male-49,

female-91) aged 16-41 years (mean age - 30 years) attending Ayurvedic Hospitals, for treatment of various organic disorders and who were suffering from moderate to severe anemia. They were undergoing treatment under Ayurvedic physicians. Out of a large number of Ayurvedic preparations, we carried out study on six most commonly prescribed drugs - *Navayasa Curna*, *Punarnavadi Mandura*, *Dhatri Lauha*, *Pradarantaka Lauha*, *Sarva-Juara-Hara Lauha* and *Vrihat Yakrdari Lauha*. The patients purchased the prescribed drugs from the local market and took them in prescribed dose with the prescribed vehicle (Table -1). In Ayurveda the vehicle is very important for success of the therapy.

In this study there were six Ayurvedic drug groups. In each group, there were 20 patients, and each drug was consumed for 30 days. The tablets were reddish brown to dark black in colour. Each tablet weighed 125 mg. These were given in a dose of two tablets twice a day. Thus each patient received 500 mg of the drug in a day, although the amount of iron received was variable depending on the iron content of the drug. For comparison, a seventh group of 20 patients was given Allopathic drug Irex - 12, containing ferrous fumarate, 350 mg; folic acid, 1.5 mg; cyanocobalamin, 15 µg and vitamin-C, 75 mg. This was also given for 30 days in a dose of 1 capsule per day.

Table 1 : Details about Iron Deficient Anemic patients and Drugs / Treatment Regimen

Group	Drug	Manufacturer	Regimen		Patients	Initial Hb (g%)			
			Elemental Iron	Vehicle		Male	Female	Range	Mean
I	Navayasa Curna	Shree Baidyanath Ayurveda Bhawan Pvt. Ltd., Naini, Allahabad	119.75 mg	honey/ water	20	9	11	3.2 - 9.6	7.86
II	Punarnavadi Mandura	Shree Baidyanath Ayurveda Bhawan Pvt. Ltd., Naini, Allahabad	100 mg	buttermilk/ water	20	8	12	3.2 - 9.8	7.50
III	Dhatri Lauha	Shree Sharma Ayurveda Mandir, Datiya, Madhya Pradesh	102.45 mg	ghee/ honey	20	8	12	3.4 - 10.5	7.76
IV	Pradarantaka Lauha	Shree Sharma Ayurveda Mandir, Datiya, Madhya Pradesh	14.85 mg	sugar/ honey/ ghee	20	-	20	3.7 - 10.2	7.14
V	Sarva-Juara-Hara Lauha	Shree Sharma Ayurveda Mandir, Datiya, Madhya Pradesh	145.55 mg	honey	20	9	11	3.5 - 9.6	7.35
VI	Vrihat Yakrdari Lauha	Gurukul Kangri Pharmacy, Haridwar	69.40 mg	ginger extract	20	7	13	3.0 - 10.6	7.94
VII	Allopathic Irex-12	Micro Labs. Ltd., Kumbalgotu Industrial Area, Bangalore	115 mg	-	20	8	12	3.2 - 10.5	7.78

Table 2 : Response of Hematological Parameters to Treatment (values represent mean $\pm$ SD)

Group	Drug		Hb (g%)	PCV (%)	TRBC (10^6 /cumm)	MCV (fl)	MCH (pg)	MCHC (g%)
I	Navayasa Curna	Pre	7.86 $\pm$ 1.49	28.80 $\pm$ 5.45	3.43 $\pm$ 0.57	83.61 $\pm$ 4.31	22.88 $\pm$ 2.44	27.37 $\pm$ 2.72
		Post	11.66 $\pm$ 1.58	35.85 $\pm$ 5.25	3.94 $\pm$ 0.54	90.78 $\pm$ 3.26	29.62 $\pm$ 1.94	32.64 $\pm$ 2.19
II	Punarnavadi Mandura	Pre	7.50 $\pm$ 1.80	27.65 $\pm$ 5.89	3.27 $\pm$ 0.61	84.18 $\pm$ 5.04	22.73 $\pm$ 2.47	26.94 $\pm$ 1.96
		Post	11.10 $\pm$ 1.89	34.04 $\pm$ 5.52	3.76 $\pm$ 0.57	90.49 $\pm$ 3.99	29.61 $\pm$ 2.51	32.51 $\pm$ 2.21
III	Dhatri Lauha	Pre	7.76 $\pm$ 1.91	28.05 $\pm$ 5.30	3.45 $\pm$ 0.67	81.44 $\pm$ 4.71	22.28 $\pm$ 2.68	27.38 $\pm$ 3.12
		Post	11.06 $\pm$ 2.11	35.40 $\pm$ 6.29	4.00 $\pm$ 0.68	88.33 $\pm$ 4.16	27.52 $\pm$ 2.17	31.12 $\pm$ 2.29
IV	Pradarantaka Lauha	Pre	7.14 $\pm$ 2.05	25.95 $\pm$ 6.15	2.99 $\pm$ 0.69	86.58 $\pm$ 2.28	23.51 $\pm$ 2.23	27.17 $\pm$ 2.49
		Post	8.09 $\pm$ 2.03	27.95 $\pm$ 6.03	3.15 $\pm$ 0.66	88.68 $\pm$ 2.95	25.48 $\pm$ 1.99	28.75 $\pm$ 2.36
V	Sarva-Juara-Hara	Pre	7.35 $\pm$ 1.86	26.25 $\pm$ 5.75	3.23 $\pm$ 0.58	80.80 $\pm$ 5.76	22.49 $\pm$ 2.89	27.80 $\pm$ 2.76
		Post	12.11 $\pm$ 1.65	38.75 $\pm$ 4.58	4.26 $\pm$ 0.48	90.99 $\pm$ 3.41	28.43 $\pm$ 2.20	31.23 $\pm$ 1.86
VI	Vrihat Yakrdari Lauha	Pre	7.94 $\pm$ 2.08	29.05 $\pm$ 6.00	3.41 $\pm$ 0.67	85.00 $\pm$ 2.72	22.93 $\pm$ 2.24	26.93 $\pm$ 2.21
		Post	11.03 $\pm$ 2.09	36.00 $\pm$ 5.78	3.95 $\pm$ 0.63	91.06 $\pm$ 2.90	27.85 $\pm$ 2.55	30.53 $\pm$ 2.34
VII	Allopathic control	Pre	7.78 $\pm$ 2.02	28.00 $\pm$ 6.03	3.40 $\pm$ 0.68	83.94 $\pm$ 3.20	22.57 $\pm$ 2.07	26.79 $\pm$ 2.06
		Post	10.91 $\pm$ 1.91	35.55 $\pm$ 5.44	3.93 $\pm$ 0.60	90.48 $\pm$ 2.59	27.71 $\pm$ 1.85	30.63 $\pm$ 1.76

All pre-and post-values are significantly different at $p < 0.001$

The patient's whole blood was collected before starting the therapy and after the completion of the therapy. The hematologic parameters - hemoglobin (Hb), packed cell volume (PCV), total red blood cell count (TRBC) were determined as described by Dacie and Lewis (9). MCV, MCH and MCHC were calculated as usual. Plasma iron (PI) and total iron binding capacity (TIBC) was determined (10) by autoanalyser using kits of Raichem, Bombay. Percent Saturation (PS) of iron was calculated from these values. Plasma ferritin was estimated by Elisa technique using kits of Syntiron Bioresearch, USA (9).

Analysis of drugs

As the information on chemical composition of Ayurvedic drugs was not available, it was decided to determine their elemental composition by ourselves.

The powdered Ayurvedic drug was first ashed in a muffle furnace and then the residue was digested in aqua-regia. The volume of the extract was reduced by boiling, then diluted by deionised water. The minerals - iron, copper, zinc, calcium and magnesium were determined by atomic absorption spectrophotometry (11), while sodium and potassium were determined in a flame photometer. The analysis of carbon, hydrogen and nitrogen in the drugs was done by Regional Sophisticated Instrumentation Centre (RSIC) of Central Drug Research Institute, Lucknow. These details are published elsewhere (12). Oxygen, sulphur and phosphorus could not

be estimated.

The statistical analysis of the analytical data were performed by paired 't' test (13).

RESULTS AND DISCUSSION

This study consisted of six groups of 20 patients who received treatment for 30 days by different Ayurvedic iron containing drugs and one group of 20 patients as control which was given Allopathic formulation (containing ferrous fumarate, vitamin C, folic acid and vitamin B₁₂) for same number of days. The allopathic formulation was a complete hematinic and its response to treatment was used to compare response to Ayurvedic formulations. The results are presented in Table 2 and Table 3.

As shown in Table 1, the patients were suffering from moderate to severe anemia and their mean Hb level prior to treatment was comparable. It can be seen from Table-2 that all the hematologic parameters increased significantly ($p < 0.001$) by treatment with Ayurvedic / Allopathic drugs. The Ayurvedic drugs were well tolerated by the patients and there was no report of any side effect, untoward reaction or intolerance. On the contrary, out of 20 patients in group VII (Allopathic control), 14 complained of one or the other side effect, like, constipation, nausea, diarrhoea etc.

From Table -3, it is clear that iron related parameters - plasma

Table 3 : Response of Iron Parameters to Treatment (values represent mean $\pm$ SD)

Group	Drug		PI (μ g/dl)	TIBC (μ g/dl)	Percent Saturation (%)	Ferritin (ng/ml)
I	Navayasa Curna	Pre	59.05 $\pm$ 16.57	410.89 $\pm$ 17.35	14.51 $\pm$ 4.33	12.34 $\pm$ 3.06
		Post	92.48 $\pm$ 17.24	371.07 $\pm$ 21.90	25.15 $\pm$ 5.42	14.71 $\pm$ 3.08
II	Punarnavadi Mandura	Pre	56.41 $\pm$ 20.46	416.15 $\pm$ 18.38	13.71 $\pm$ 5.24	11.72 $\pm$ 4.13
		Post	86.58 $\pm$ 21.65	379.80 $\pm$ 17.66	23.04 $\pm$ 6.46	13.47 $\pm$ 4.46
III	Dhatri Lauha	Pre	54.42 $\pm$ 19.14	414.33 $\pm$ 14.97	13.27 $\pm$ 4.95	11.84 $\pm$ 4.55
		Post	82.71 $\pm$ 22.13	372.64 $\pm$ 26.66	22.54 $\pm$ 6.73	13.20 $\pm$ 4.66
IV	Pradarantaka Lauha	Pre	47.86 $\pm$ 21.66	420.98 $\pm$ 18.49	11.59 $\pm$ 5.59	10.78 $\pm$ 3.99
		Post	58.57 $\pm$ 21.94	405.58 $\pm$ 20.86	14.71 $\pm$ 5.99	11.19 $\pm$ 4.04
V	Sarva-Juara-Hara Lauha	Pre	54.64 $\pm$ 21.03	415.08 $\pm$ 17.22	13.34 $\pm$ 5.41	13.27 $\pm$ 3.95
		Post	88.76 $\pm$ 18.41	362.07 $\pm$ 19.78	24.69 $\pm$ 5.80	16.08 $\pm$ 3.87
VI	Vrihat Yakrdari Lauha	Pre	56.90 $\pm$ 21.41	415.07 $\pm$ 10.41	13.81 $\pm$ 5.40	11.07 $\pm$ 3.44
		Post	83.48 $\pm$ 19.45	369.52 $\pm$ 18.30	22.78 $\pm$ 6.17	12.15 $\pm$ 3.53
VII	Allopathic control	Pre	56.06 $\pm$ 21.82	414.30 $\pm$ 14.07	13.56 $\pm$ 5.55	12.55 $\pm$ 4.00
		Post	84.43 $\pm$ 19.00	376.75 $\pm$ 19.04	22.63 $\pm$ 5.85	13.65 $\pm$ 3.95

All pre-and post-values are significantly different at $p < 0.001$

iron, percent saturation and plasma ferritin increased significantly ($p < 0.001$) in all the Ayurvedic and one Allopathic group patients. As happens on treatment of anemia, TIBC decreased significantly ($p < 0.001$).

In order to assess comparative efficacy of various drugs, percent rise in hematologic and iron related parameters, was calculated. This is presented in Table 4.

It is clear from Table-4 that the drug *Sarva-Juara-Hara Lauha* (group V) was found to be most effective and the drug

Pradarantaka Lauha (group IV) least effective in correcting anemia and iron deficiency. The response of most of the drugs was better or almost similar to Allopathic hematinic (group VII). In fact, Hb regeneration by *Sarva-Juara-Hara Lauha* (group V) was almost 1½ times that of best Allopathic hematinic. The efficacy of different drugs for Hb generation in decreasing order was: - V > I> II> III>VII>VI> IV.

Taking PCV as the criteria, the response of group I, II, III and VI was more or less equal to Allopathic drug (Group VII) and was intermediate of two extremes — group V (best) and group

Table 4 : Percent Change in Hematological and Iron Parameters after Treatment

Parameter	Drug Group						
	I Navayasa Curna	II Punarnavadi Mandura	III Dhatri Lauha	IV Pradarantaka Lauha	V Sarva- Juara- Hara Lauha	VI Vrihat Yakrdari Lauha	VII Ferrous fumarate
Hb	48.3	48.0	42.5	13.3	64.8	38.9	40.2
PCV	24.5	23.1	26.2	7.7	47.6	23.9	24.3
TRBC	14.9	15.0	15.9	5.4	31.9	15.8	15.6
MCV	8.6	7.5	8.5	2.4	12.6	7.1	7.8
MCH	29.5	30.3	23.5	8.4	26.4	21.4	22.8
MCHC	19.3	20.7	13.7	5.8	12.3	13.3	14.3
PI	56.6	53.5	52.0	22.4	62.4	46.7	50.6
TIBC	-9.7	-8.7	-10.1	-3.7	-12.8	-11.0	-9.1
PS	73.3	68.0	69.9	26.8	85.1	65.0	66.8
FER	19.2	14.9	11.5	3.8	21.2	9.8	8.8

IV (worst). Again the response to group V (*Sarva-Juara-Hara Lauha*) was twice that of Allopathic hematinic containing ferrous fumarate.

The effect of Ayurvedic drugs in correcting iron deficiency was also noteworthy (Table -4). Taking plasma ferritin as an indicator of storage iron and plasma iron and percent saturation of transport iron following observations are made :

- (i) The efficacy of Ayurvedic drugs in increasing storage iron (ferritin) far exceeded that of ferrous fumarate (group VII) except group IV (*Pradarantaka Lauha*). For this purpose, *Sarva-Juara-Hara Lauha* (group V) and *Navayasa Curna* (group I) were exceptionally good.
- (ii) The Allopathic ferrous fumarate (group VII) was superior to only *Pradarantaka Lauha* (group IV) and *Vrihat Yakrdari Lauha* (group VI) in raising plasma iron, but was inferior to rest of the four Ayurvedic drugs (group I, II, III and V). Again *Sarva-Juara-Hara Lauha* (group V) was found to be best. Its effect was roughly $1\frac{1}{4}$ times that of Allopathic preparation (group VII).
- (iii) Similar findings were also obtained when percent saturation was taken as the criteria of iron status. *Navayasa Curna* (group I) and *Sarva-Juara-Hara Lauha* (Group V) were highly effective in raising percent saturation of patients. The potency of *Sarva-Juara-Hara Lauha* (Group V) was $1\frac{1}{3}$ times that of Allopathic preparation (Group VII).

As the therapeutic effectiveness of iron preparation can be measured from the resulting increase in the Hb (14), we have calculated the rate of Hb regeneration per day. The rise in Hb /day was found to be 0.13, 0.12, 0.11, 0.03, 0.16, 0.10 and 0.10 g/dl for groups I to VII respectively. Thus ferrous fumarate

regenerated Hb at the rate of 0.10 g/dl per day which is considered a good response (15), it can be seen that all Ayurvedic drugs except one, (*Pradarantaka Lauha*, group IV) caused Hb regeneration at par or more than ferrous fumarate. The drug *Sarva-Juara-Hara Lauha* (Group V) topped the list. One reason behind the best response of group V and worst response of group IV, may have been their iron content (Table -5).

From Table -5 it can be seen that *Sarva-Juara-Hara Lauha* had the highest iron content while *Pradarantaka Lauha* had the lowest. However *Vrihat Yakrdari Lauha* (group VI) raised Hb at the same rate as ferrous fumarate while iron content in it was only about 42% of it.

The examination of Table-5 also reveals that a substantial part of these Ayurvedic preparations was organic matter. These may be substances like ascorbic acid, sugars, amino acids, organic acids, which cause better absorption of non-heme iron (16).

The absorption of iron may have increased by the recommended vehicle for the Ayurvedic preparations (Table-1). For example, some preparations (*Navayasa Curna*, *Dhatri Lauha*, *Pradarantaka Lauha* and *Sarva-Juara-Hara Lauha*) were administered with honey as the vehicle; which is known to be a mixture of glucose and fructose and iron may complex with these sugars for absorption. It may be mentioned here that Allopathic system also uses iron polymaltose complex and ferrous gluconate for therapy with good results (4).

The preparations, *Dhatri Lauha* and *Pradarantaka Lauha* were also advised to be taken with butter oil. It may be possible

Table 5 : Elemental Composition of Ayurvedic Drugs (%)

Group	Name of Drug	Carbon	Hydrogen	Nitrogen	Iron	Copper	Zinc	Calcium	Magnesium	Sodium	Potassium	Total	Other Elements Oxygen, Sulphur etc.	Grand Total
I	Navayasa Curna	28.84	3.66	1.58	23.95	0.07	0.01	0.61	0.71	0.55	1.05	61.03	38.97	100.00
II	Punarnavadi Mandura	23.61	3.02	1.44	20.00	0.01	0.01	3.81	1.03	0.50	1.25	54.68	45.32	100.00
III	Dhatri Lauha	17.71	2.42	1.54	20.49	0.04	0.02	0.69	0.21	0.80	1.20	45.12	54.88	100.00
IV	Pradarantaka Lauha	28.11	4.28	1.52	2.97	1.03	0.02	5.07	0.57	7.50	1.40	52.47	47.53	100.00
V	Sarva- Juara- Hara Lauha	23.38	3.22	1.40	29.11	0.07	0.01	0.47	0.25	0.80	1.10	59.81	40.19	100.00
VI	Vrihat Yakrdari Lauha	20.97	2.53	1.37	13.88	0.02	0.05	0.51	0.38	0.90	2.40	43.01	56.99	100.00

that iron fatty acid complex may be formed in the gut after digestion of ghee (clarified butter) and then absorbed. One of the preparation, *Punarnavadi Mandura*, was swallowed with buttermilk, which has acidic pH and contains lactic acid. Iron absorption is aided by decreased pH (16). It is also possible that iron combines with lactic acid to form ferrous lactate before absorption. Allopathic system also uses ferrous lactate for treatment of anemia (3). Alternatively, it is possible that proteins of buttermilk or amino acids released upon their digestion may combine with iron before absorption takes place. This view is supported by the fact that W.H.O. has also recommended use of meat or other proteins to enhance iron absorption (15) and that ferrous glycine sulfate is widely used as iron salt in Allopathy (3).

An unusual vehicle, ginger extract, was used in case of *Vrihat Yakrdari Lauha*. Ginger is the root of *Zingiber officinale*. 100 gram of ginger consists of protein (2.3g), fat (0.9g), carbohydrate (12.3g), thiamin (60µg), riboflavin (30µg), nicotinic acid (0.6mg), calcium (20mg), iron (2.6 mg) and phosphorus (60 mg) (17). Again the carbohydrate or protein of ginger may help in iron absorption.

This study conclusively proved that most of these Ayurvedic preparations were better than Allopathic hematinic used in present study for the treatment of iron deficiency and anemia. The lack of side effects was additional important advantage. Out of these six preparations, *Sarva-Juara-Hara Lauha* was the drug of choice.

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