10.5005/jp-journals-10064-0010

RESEARCH ARTICLE

Clinical Safety of Selected Ayurvedic Formulations in Iron Deficiency Anemia

[1]Babita Yadav, [2]Rajesh Sannd, [3]Banmali Das, [4]HML Meena, [5]Omraj Sharma, [6]Harbans Singh, [7]BR Meena
[8]SK Sharma, [9]VB Kumavat, [10]Sophia Jameela, [11]Pradeep Dua, [12]GC Bhuyan, [13]Shruti Khanduri
[14]Rakesh Rana, [15]Pratap Makhija, [16]Richa Singhal, [17]Adarsh Kumar, [18]Narayanam Srikanth

ABSTRACT

Introduction: Anemia is a condition in which the number of red blood cells (RBCs) or their oxygen-carrying capacity is insufficient to meet physiologic needs of the body and is characterized by a constellation of symptoms. Ayurveda compares the symptoms of anemia with that of the disease Pandu. *Punarnavadi Mandura*, *Dadimadi Ghrta*, *Navayasa Churna*, and *Dhatri Lauha* are few among the multitudes of medicines that are currently prevalent in use for the management of Pandu. However, the safety of these drugs were not evaluated until now through clinical drug trials.

Objective: Critical analysis and presentation of clinical safety and efficacy outcomes of classical Ayurvedic formulations, viz., *Dhatri Lauha*, *Navayasa Churna*, *Punarnavadi Mandura*, and *Dadimadi Ghrta* in iron deficiency anemia (IDA).

Materials and methods: A retrospective analysis of data collected from three different clinical studies that had been completed in peripheral institutes of Central Council for Research in Ayurvedic Sciences (CCRAS) were critically evaluated to assay the safety profile of four drugs, namely *Dhatri Lauha*, *Navayasa Churna*, *Punarnavadi Mandura*, and *Dadimadi Ghrta* in patients of IDA. Safety assessments were done through analyzing liver function test (LFT) and renal function test before and after the trial period. Paired sample t-test was used to compare the mean changes from baseline to the end of the trial period. A p-value of <0.05 was considered significant. Drug compliance and adverse drug reaction (ADR)/adverse events (AE), if any, were noted.

Conclusion: The findings in the three different clinical studies clearly reveal that *Punarnavadi Mandura*, *Navayasa Churna*, *Dhatri Lauha*, and *Dadimadi Ghrta* are clinically safe, effective, and tolerable.

Keywords: *Dadimadi Ghrta*, *Dhatri Lauha*, Iron deficiency anemia, *Navayasa Churna*, Pandu, *Punarnavadi Mandura*.

How to cite this article: Yadav B, Sannd R, Das B, Meena HML, Sharma O, Singh H, Meena BR, Sharma SK, Kumavat VB, Jameela S, Dua P, Bhuyan GC, Khanduri S, Rana R, Makhija P, Singhal R, Kumar A, Srikanth N. Clinical Safety of Selected Ayurvedic Formulations in Iron Deficiency Anemia. J Res Ayurvedic Sci 2017;1(2):99-107.

Source of support: Nil

Conflict of interest: None

[1,3,4,6,7,9-13,15]Research Officer (Ayurveda), [2,8,17]Assistant Director (Ayurveda), [5]Former Assistant Director (Ayurveda), [14]Statistical Officer (Statistics), [16]Senior Statistical Assistant (Statistics) [18]Deputy Director General (Ayurveda)

[1,2,10,13-18]Central Council for Research in Ayurvedic Sciences New Delhi, India

[3,12]Central Ayurveda Research Institute for Hepatobiliary Disorders, Bhubaneshwar, Odisha, India

[4,9]M.S. Regional Ayurveda Research Institute for Endocrine Disorders, Jaipur, Rajasthan, India

[5,8]Regional Ayurveda Research Institute for Nutritional Disorders Mandi, Himachal Pradesh, India

[6]Central Ayurveda Research Institute for Respiratory Disorders Patiala, Punjab, India

[7,11]Ministry of Ayush, New Delhi, India

Corresponding Author: Babita Yadav, Research Officer (Ayurveda), Central Council for Research in Ayurvedic Sciences, New Delhi, India, Phone: +911128080453, e-mail: drbabitayadav@gmail.com

INTRODUCTION

Anemia is a condition characterized by reduced circulating hemoglobin in the body and it often acts as a major disease or as a secondary condition associated with many other diseases. Iron deficiency is the major contributor to anemia globally. World Health Organization (WHO) estimates that prevalence of anemia is 14% in developed countries, 51% in developing countries, and 65 to 75% in India.[1] The National Family Health Survey 2(4) and 3(5), Indian Council of Medical Research estimates reveal the prevalence of anamia to be over 70% in preschool children, over 70% in pregnant women and adolescent girls.[2] Iron deficiency is defined as a condition in which there is depletion of mobilizable iron stores in the body and associated with signs of insufficient supply of iron to tissues. The more severe stages of iron deficiency are associated with anemia.[3] When iron-deficient erythropoiesis occurs, hemoglobin concentrations are reduced to below optimal levels. When individual hemoglobin levels are below two standard deviations (–2SD) of the distribution mean for hemoglobin in an otherwise normal population of the same gender and age who are living at the same altitude, IDA is considered to be present.[3] Although the etiology of IDA is multifaceted, it generally results when the iron demands by the body are not met by iron absorption, regardless of the reason. Individuals with IDA have inadequate intake, impaired absorption or transport, physiologic losses associated with

chronological or reproductive age, or chronic blood loss secondary to disease.[4] The modern management of IDA is done through oral and parenteral iron therapy which is associated with many adverse effects, such as nausea, abdominal discomfort, diarrhea, and constipation in oral use and hypersensitive reactions, hemolysis, hypotension, circulatory collapse, vomiting, and muscle pain in parental therapy. Hence, it is the need of the current medical world to explore complementary and alternative systems of medicine to come up with alternative options which are safe and effective at the same time.

Ayurveda has explained in detail about the disease *Pandu roga* in almost all major classics, which is symptomatically similar to IDA and has described the symptoms, types, pathogenesis, its therapeutic and other interventions in detail. *Dhatri Lauha*, *Navayasa Churna*, *Punarnavadi Mandura*, and *Dadimadi Ghrta* are few among the multitudes of formulations in Ayurveda that are presently in use. This set of studies was done to analyze the safety of *Dhatri Lauha*, *Navayasa Churna*, *Punarnavadi Mandura*, and *Dadimadi Ghrta* in patients with IDA.

Drug Profile

Ayurveda has considered *Pandu* as a symptom as well as disease, and the drugs mentioned in this context have *rakta poshana* (nourishing blood), *deepana* (potentiating digestive activity), *doshaanulomana* (normalizing the doshic mechanism), *srotosodhana* (clearing the microchannels of circulation), and *dhatu preenana* (nourishing the body tissues) properties. Drugs are chosen as per the etiology and hence, the legion of drugs mentioned in this context has multifarious actions. *Dhatri Lauha*[5] is a formulation mentioned in Bhaisajya Ratnavali. *Punarnavadi Mandura*,[6] *Navayasa Churna*,[7] and *Dadimadi Ghrta*[8] are said by Charaka in the context of *Pandu* roga itself (Table 1).

Table 1: Components of *Dhatri Lauha*, *Punarnavadi Mandura*, *Dadimadi Ghrta*, and *Navayasa Churna*

Sanskrit name	*Botanical name*	*Part used*
Punarnavadi Mandura[9]		
Punarnava	*Boerhavia diffusa*	Root
Trivrt	*Operculina turpethum*	Root bark
Sunthi	*Zingiber officinale*	Dried tuber
Maricha	*Piper nigrum*	Dried fruit
Pippali	*Piper longum*	Dried fruit
Vidanga	*Embelia ribes*	Dried fruit
Devadaru	*Cedrus deodara*	Bark
Chitraka	*Plumbago zeylanica*	Root
Kushta	*Saussurea lappa*	Root
Haridra	*Curcuma longa*	Rhizome
Daruharidra	*Berberis aristata*	Heart wood
Haritaki	*Terminalia chebula*	Dried fruit
Bibhitaki	*Terminalia bellerica*	Dried fruit
Amalaki	*Emblica officinalis*	Dried fruit
Danti	*Baliospermum montanum*	Root
Chavya	*Piper chaba*	Dried fruit
Kalingaka	*Holarrhena antidysentrica*	Stem bark
Pippali mula	*Piper longum*	Root
Musta	*Cyperus rotundus*	Rhizome
Mandura bhasma	*Calcined iron*	Powder
Navayasa Churna[10]		
Sunthi	*Zingiber officinale*	Dried rhizome
Maricha	*Piper nigrum*	Dried fruit
Pippali	*Piper longum*	Dried fruit
Haritaki	*Terminalia chebula*	Dried fruit
Bibhitaki	*Terminalia bellerica*	Dried fruit
Amalaki	*Emblica officinalis*	Dried fruit
Musta	*Cyperus rotundus*	Rhizome
Vidanga	*Embelia ribes*	Dried fruit
Chitraka	*Plumbago zeylanica*	Root
Ayoraja	*Calcined iron*	Powder
Dhatri Lauha[11]		
Dhatri	*Emblica officinalis*	Dried fruit
Lauha bhasma	*Calcined iron*	Powder
Yastimadhu	*Glycyrrhyza glabra*	Root
Guduchi	*Tinospora cordifolia*	Whole plant
Dadimadi Ghrta[12]		
Dadima	*Punica granatum*	Fruit
Dhanya	*Coriandrum sativum*	Seeds
Chitraka	*Plumbago zeylanica*	Roots
Sringivera	*Zingiber officinale*	Rhizome
Pippali	*Piper nigrum*	Fruit
Goghrta	Clarified butter from cow's milk	

OBJECTIVE

Critical analysis and presentation of clinical safety and efficacy outcomes of classical Ayurvedic formulations, viz., *Dhatri Lauha*, *Navayasa Churna*, *Punarnavadi Mandura*, and *Dadimadi Ghrta* in IDA, were generated through multicenter open label studies at different CCRAS centers.

MATERIALS AND METHODS

The formulations fulfilling the physicochemical standards and quality parameters, and prepared as per standard operating procedures, were procured from good manufacturing practice-certified companies for all the studies. The three different clinical studies were approved by institutional ethics committee of all the participating centers and done in accordance with WHO Good Clinical Practice guidelines. The data obtained from the completed clinical studies were analyzed retrospectively to assess the safety profile of *Dhatri Lauha*, *Navayasa Churna*, *Punarnavadi Mandura*, and *Dadimadi Ghrta* through LFTs and KFTs.

Open label multicenter clinical trials were done in selected peripheral institutes of CCRAS to evaluate the safety and efficacy of *Dhatri Lauha*, *Navayasa Churna*, *Punarnavadi Mandura*, and *Dadimadi Ghrta* in IDA and the details are briefed in Table 2. Follow-up was done

Table 2: Brief description of studies conducted in the management of IDA

Name of study	*Study period*	*Study design*	*Number of centres*	*Name of participant institutes*	*Sample size*	*Study interventions*	*Dosage schedule*	*Intervention period*
Clinical safety and efficacy of *Dhatri Lauha* (A classical ayurvedic Formulation) in Iron deficiency anaemia (IDA)	2007–2009	Open label multicenter study	11	1. CARIN and MSD, Cheruthuruthy 2. CARICD, New Delhi 3. CARIHD, Bhubhaneswar 4. RARIED, Lucknow 5. MSRARIED, Jaipur 6. RARIDD, Gwalior 7. RARIMD, Bangalore 8. RARIID, Patna 9. RARI, Gangtok 10. RARIUD, Jammu 11. RARIMD, Mandi	400	*Dhatri Lauha*	500 mg BD with water	45 days
Clinical evaluation of *Punarnavadi Mandura* and *Dadimadi Ghrta* in the management of IDA	2011–2012	Open label multicenter study	3	1. CARIRD, Patiala 2. MSRARIED, Jaipur 3. CARIHD, Bhubhaneswar	90	Punarnavadi Mandura *Dadimadi Ghrta*	500 mg BD daily with water 10 mg BD With milk/water	84 days
Clinical evaluation of *Navayasa Churna* in the management of IDA	2014–2016	Open label multicenter study	3	1. RARIND, Mandi 2. MSRARIED, Jaipur 3. CARIRD, Patiala	150	*Navayasa Churna*	1 gm BD with water	84 days

CARINMD: Central Ayurveda Research Institute for Neuromuscular and Musculo-Skeletal Disorders, Cheruthuruthy; CARICD: Central Ayurveda Research Institute for Cardiovascular Diseases, New Delhi; CARIHD: Central Ayurveda Research Institute for Hepatobiliary Disorders, Bhubaneswar; RARIED: Regional Ayurveda Research Institute for Eye Diseases, Lucknow; MSRARIED: M.S. Central Research Institute (Ay.), Jaipur; RARIDD: Regional Ayurveda Research Institute for Drug Development, Gwalior; RARIMD: Regional Ayurveda Research Institute for Metabolic Disorders, Bengaluru; RARIID: Regional Ayurveda Research Institute for Infectious Diseases, Patna; RARIUD: Regional Ayurveda Research Institute for Urinary Disorders, Jammu; RARIND: Regional Ayurveda Research Institute for Nutritional Disorders, Mandi

every 2 weeks to record the onset of any adverse reaction during the intervention. The data thus generated were analyzed to evaluate the safety and efficacy of these drugs in patients with IDA.

Statistical Analysis

Laboratory parameters at the beginning and at the end of the trial period were compared using paired t-test. A p-value of <0.05 was considered significant. All statistical analyses were performed using Statistical Package for Social Sciences, version 15.0.

OBSERVATION

Dhatri Lauha

Among the total 400 patients who completed the trial, majority were females and maximum of the patients belonged to the age group of 21 to 40 years, i.e., 205 patients. About 73.5% were literate and 58.25% hailed from lower socioeconomic stratum. Maximum numbers of patients were housewives, closely followed by students. Among the cardinal symptoms of anemia, weakness was the major symptom seen (99.25%), closely followed by fatigue (98%) and palpitation (60%) during the baseline, and *Dhatri Lauha* provided significant improvement in all these qualitative parameters. After the trial period, clinical improvement was significantly seen in 79.25% of cases. The therapy also provided statistically significant changes in hematological parameters, such as Hb%, serum iron, serum ferritin, and mean corpuscular hemoglobin concentration (MCHC). Serum bilirubin, serum glutamic pyruvic transaminase (SGPT), serum glutamic oxaloacetic transaminase (SGOT), serum alkaline phosphatase, total protein, serum albumin, serum globulin, blood urea, and serum creatinine were within normal limits during the entire period. No significant AEs or ADEs were observed during the study.

Punarnavadi Mandura and *Dadimadi Ghrta*

Among the 90 patients who were selected for the study, 91.1% were females and 51.1% were housewives. About 81.1% of patients were above poverty line and 61.1% were vegetarians. A total of 61.1% of patients belonged to *Vata-Pittaja prakrti*. The major symptoms noted in the patients were weakness (98.9%), fatigue (98.9%), dizziness (60%), irritability (52.2%), and pallor (56.7%). After the trial period, significant changes were obtained in these parameters and statistically significant change was observed in hematological parameters, such as mean cell hemoglobin concentration ($p < 0.001$), serum ferritin, and serum iron ($p < 0.001$). The levels of blood urea, serum uric acid, serum creatinine, SGOT, SGPT, total protein, serum albumin, serum globulin, conjugated bilirubin, unconjugated bilirubin, and serum alkaline phosphatase remained within the specified limits during the trial period. The patients were closely observed during the trial period and no adverse reactions or AEs were identifiable as pertaining to drug interaction.

Navayasa Churna

Among the total 150 patients enrolled in the study, maximum number of patients (26.0%) were found to be in the age group of 32 to 38 years followed by 22.7% in the age group of 39 to 45 years, and 96% of the patients were females. The majority of subjects were observed to be vegetarian (74.0%). Prevalence of anemia was found to be more in *Vata-Pittaja prakrti*. The major symptoms observed were weakness (79.8%), fatigue (71.3%), pallor (66.1%), shortness of breath (58.8%), and irritability (56.9%). Statistically significant improvement was observed in all these qualitative parameters. The drugs produced significant change in hemoglobin percentage and serum ferritin levels with p-value <0.001. No adverse reactions were noticed during the trial period. Serum bilirubin, SGPT, SGOT, serum alkaline phosphatase, total protein, albumin, globulin, blood urea, and serum creatinine were within normal limits during the entire period. The p-value of all these biochemical parameters was greater than 0.05 and hence, deemed statistically insignificant.

The data, regarding demographic profile, efficacy, and safety, obtained from the three studies are given in Tables 3, 4 and Graphs 1 to 4.

DISCUSSION

Anemia is one among the most common nutritional deficiency disorders in the world. The causes for anemia include nutritional deficiencies, external or internal blood loss and increased destruction of RBCs, ineffective or decreased production of RBC, abnormal hemoglobin synthesis, bone marrow suppression by toxins, chemicals, or radiation, infection, bone marrow replacement by malignant cells, etc.[13] Iron deficiency anemia develops when body stores of iron drop too low to support normal RBC production. Inadequate dietary iron, impaired iron absorption, bleeding, or loss of body iron in the urine may be the cause.[14] Modern treatment of IDA consists of correcting the underlying etiology and replenishing of iron stores in the body. The aim of iron therapy is to obtain maximal absorption with a minimum of side effects. To evaluate the effectiveness of oral iron preparations, it is thus necessary to know both their absorbability and their side-effects. On perusing these studies, it is observed that majority of IDA patients are women in the reproductive age group and it can be assumed that it is because of the

Table 3: Demographic profile of the patients in all the three clinical trials

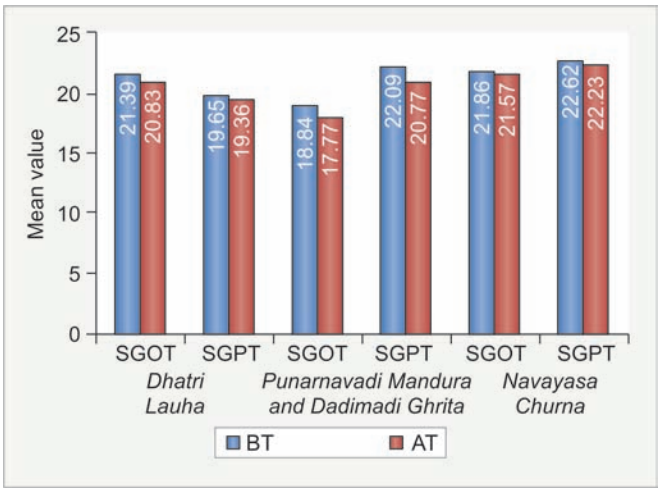
Demographic profile	*Dhatri Lauha (n = 400)*	*Punarnavadi Mandura and Dadimadi Ghrta (n = 90)*	*Navayasa Churna (n = 150)*
Sex			
Male	37 (9.2%)	8 (8.9%)	6 (4.0%)
Female	363 (90.8%)	82 (91.1%)	144 (96.0%)
Education			
Not able to read and write	106 (26.5%)	19 (21.1%)	18 (12.0%)
Literate	294 (73.5%)	71 (78.9%)	132 (88.0%)
Socioeconomic status			
Below poverty line	233 (58.3%)	73 (81.1%)	24 (16.0%)
Above poverty line	167 (41.8%)	17 (18.9%)	126 (84.0%)
Diet			
Vegetarian	168 (42.0%)	55 (61.1%)	111 (74.0%)
Nonvegetarian	232 (58.0)	35 (38.9%)	39 (26.0%)
Prakriti			
Vataja	18 (4.5%)	01 (1.1%)	
Pittaja	21 (5.3%)	01 (1.1%)	01 (0.7%)
Kaphaja	9 (2.3%)		
Vata-Pittaja	197 (49.3%)	55 (61.1%)	114 (76.0%)
Pitta-Kaphaja	119 (29.8%)	28 (31.1%)	33 (22.0%)
Vata-Kaphaja	36 (9.0%)	02 (2.2%)	02 (1.3%)
Patients completing the trial from different geographical locations			
Kerala (Cheruthuruthy)	40 (10.0%)		
Delhi	17 (4.3%)		
Odisha (Bhubaneswar)	8 (2.0%)	18 (20.0%)	
Uttar Pradesh (Lucknow)	38 (9.5%)		
Rajasthan (Jaipur)	40 (10.0%)	35 (38.9%)	50 (33.3%)
Madhya Pradesh (Gwalior)	46 (11.5%)		
Karnataka (Bengaluru)	24 (6.0%)		
Bihar (Patna)	40 (10.0%)		
Sikkim (Gangtok)	41 (10.3%)		
Jammu	26 (6.5%)		
Himachal Pradesh (Mandi)	39 (9.8%)		50 (33.3%)
Maharashtra (Wardha)	41 (10.3%)		
Punjab (Patiala)		37 (41.1%)	50 (33.3%)

uncompensated iron depletion in them owing to monthly menstruation, pregnancies, and lactation. The *prakrti* of these patients were observed to be *Vata-Pittaja* predominantly and this might be attributed to the fact that *dhatu saara* attrition owing to *vata* and *pitta* are more common in this *prakrti*. Common symptoms manifested were dizziness, palpitation, weakness, fatigue, and pallor which can be ascribed to the deficient circulation and hypoxia secondary to anemia. The symptoms of anemia point to the functional depletion of *rasa* and *rakta dhatu* and these medicines are expected to correct the *agnimandya* at *dhatu* level and clear the *srotas* to enhance the absorption and also stimulate erythropoiesis. In these studies, significant changes were noticed in the aforementioned qualitative parameters and the quantitative parameters, such as serum iron, serum ferritin, serum total iron binding capacity, and hemoglobin. This study was to assess the safety profile of these drugs by analyzing the liver function and kidney function before and after the trial. Drug compliance and development of adverse effects if any were scrutinized. In-depth observations revealed that there there was no significant change in the parameters: Blood urea, serum uric acid, serum creatinine, total protein, serum globulin, serum albumin, SGOT, SGPT, and bilirubin levels in the body, from the baseline, as assessed by statistical evaluation which showed p-value of >0.05, which is statistically insignificant. Hence, it can be concluded that these iron-containing drugs enhance the bioavailability of iron in the body for erythropoiesis without adversely affecting the body in any way. The patients were closely monitored and no ADR/AE could be identified due to drug interaction during the trial period in the case of all four formulations and hence, *Dhatri Lauha*, *Navayasa Churna*, *Punarnavadi Mandura*, and *Dadimadi Ghrta* can be considered to be clinically safe and effective in IDA.

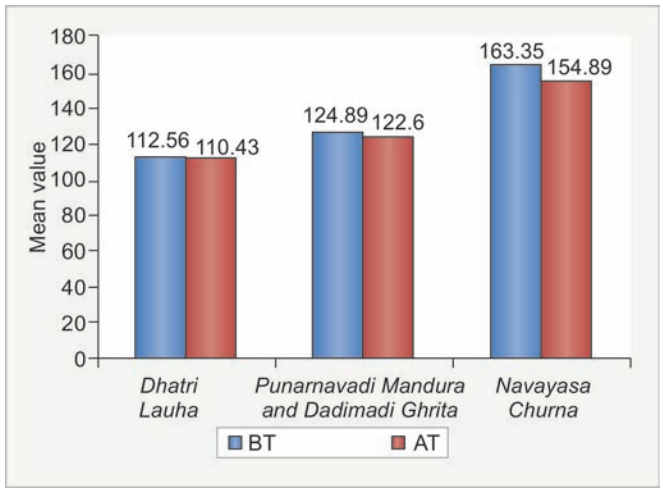
Table 4: Efficacy and safety profile of the patients in three clinical trials

	Dhatri Lauha			*Punarnavadi Mandura and Dadimadi Ghrta*			*Navayasa Churna*		
Parameters	*Before treatment*	*After treatment*	*p-value*	*Before treatment*	*After treatment*	*p-value*	*Before treatment*	*After treatment*	*p-value*
Hemoglobin (g/dL)	8.46 (1.14)	9.18 (1.61)	<0.001	9.29 (0.67)	9.32 (1.266	0.325	9.07 (0.65)	9.68 (1.01)	<0.001
MCHC (g/dL)	29.48 (2.92)	30.63 (3.19)	<0.05	29.77 (1.57)	30.06 (4.71)	0.024*	29.35 (2.21)	29.30 (2.30)	0.761
MCV (fL)	71.97 (8.46)	76.39 (10.79)	<0.05	78.71 (10.82)	75.37 (14.29)	0.005*	80.2 (11.11)	80.52 (11.6)	0.685
Serum iron (µg/dL)	31.08 (11.28)	46.58 (29.66)	<0.05	41.13 (26.49)	47.17 (29.57)	0.005*	39.5 (28.74)	42.78 (26.89)	0.111
Serum ferritin (µg/L)	11.47 (8.35)	17.76 (18.51)	<0.05	23.23 (30.90)	22.73 (34.46)	0.021*	10.26 (7.53)	14.19 (12.1)	<0.001
PCV (%)	28.46 (3.96)	30.50 (5.28)	<0.05	31.76 (2.51)	31.32 (4.09)	0.691	31.58 (3.93)	32.56 (4.85)	0.009*
TIBC	Not done			430.52 (115.346)	417.18 (114.312)	0.305	437.63 (68.882)	424.00 (73.804)	0.018
LFT									
Serum bilirubin total	0.62 (0.29)	0.60 (0.22)	>0.05						
Serum bilirubin (indirect)				0.53 (0.42)	0.43 (0.27)	0.002*	0.362 (0.23)	.39 (0.27)	0.072
Serum bilirubin (direct)	0.21 (0.14)	0.20 (0.14)	>0.05	0.30 (0.29)	0.29 (0.24)	0.870	0.367 (0.28)	.34 (0.28)	0.038*
SGPT (IU/L)	19.65 (11.53)	19.36 (9.5)	>0.05	22.09 (5.63)	20.77 (6.51)	0.021*	22.62 (6.18)	22.23 (5.82)	0.502
SGOT (IU/L)	21.39 (8.58)	20.83 (7.37)	>0.05	18.84 (8.14)	17.77 (6.15)	0.138	21.86 (7.50)	21.57 (6.66)	0.583
Serum alkaline phosphatase (IU/L)	112.56 (67.60)	110.43 (67.28)	>0.05	124.89 (88.23)	122.60 (90.40)	0.694	163.35 (87.06)	154.89 (77.33)	0.052
Total protein (gm/dL)	7.07 (3.15)	7.11 (3.19)	>0.05	7.34 (0.51)	7.32 (0.54)	0.629	7.42 (0.55)	7.48 (1.37)	0.598
Albumin (gm/dL)	4.07 (1.29)	4.08 (0.52)	>0.05	4.40 (0.52)	4.35 (0.52)	0.113	4.27 (0.36)	4.29 (0.38)	0.607
Globulin (gm/dL)	2.96 (1.32)	2.87 (0.625)	>0.05	2.93 (0.46)	2.95 (0.54)	0.583	3.14 (0.42)	3.10 (0.40)	0.115
KFT									
Blood urea (mg/dL)	22.91 (7.16)	22.44 (6.24)	>0.05	20.48 (5.02)	20.56 (5.07)	0.847	21.92 (4.57)	23.07 (7.89)	0.048*
Serum creatinine (mg/dL)	0.87 (0.18)	0.89 (0.21)	>0.05	0.81 (0.09)	0.83 (0.11)	0.136	1.00 (1.89)	0.88 (0.41)	0.457
Uric acid (mg/dL)							4.25 (1.03)	4.55 (2.57)	0.111

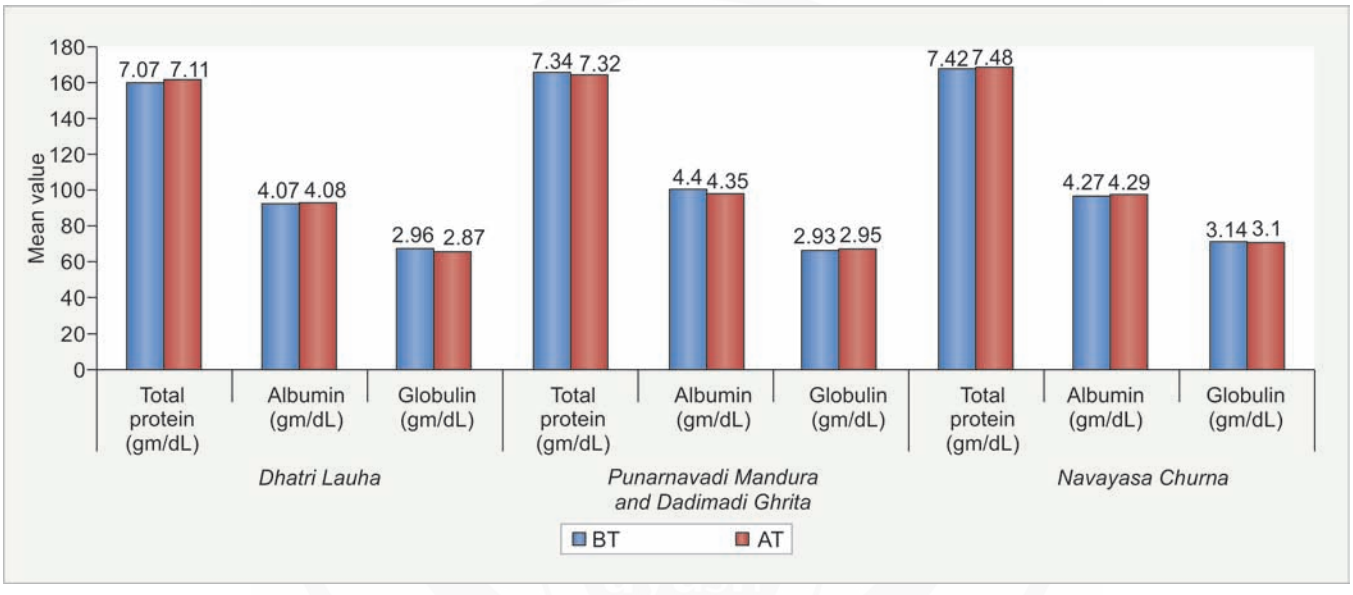
*A p-value of <0.05 only is considered significant; MCV: Mean corpuscular volume; PCV: Packed cell volume; TIBC: Total iron-binding capacity



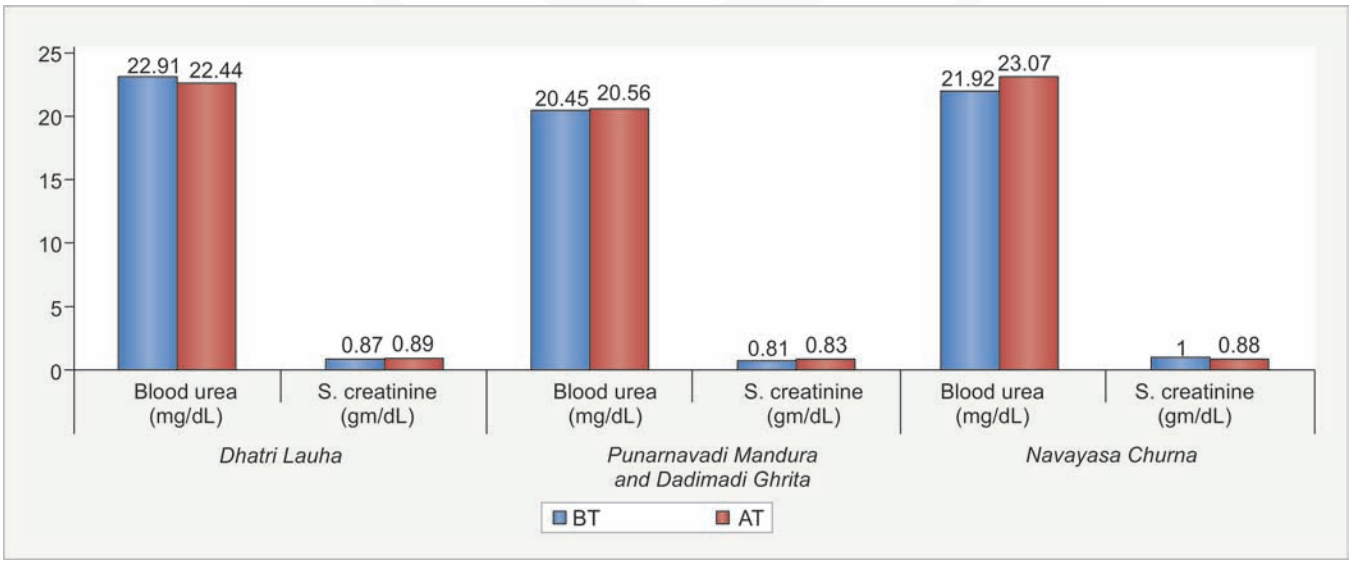
Graph 1: Comparison of LFTs (SGOT and SGPT) before and after the trial in three studies



Graph 2: Comparison of LFT (serum alkaline phosphatase) before and after the trial in three studies



Graph 3: Comparison of LFT (total protein, albumin, and globulin) before and after the trial in three studies



Graph 4: Comparison of KFT (blood urea and serum creatinine) before and after the trial in the three studies

CONCLUSION

The study to evaluate the safety and efficacy of *Dhatri Lauha*, *Navayasa Churna*, *Punarnavadi Mandura*, and *Dadimadi Ghrta* was conducted at peripheral institutes of CCRAS spread throughout various biogeographical areas of India. The analysis of outcome of these scientifically planned studies demonstrates that in spite of the differences in gender, socioeconomic status, age group, *prakrti*, and geographic region, *Dhatri Lauha*, *Navayasa Churna*, *Punarnavadi Mandura*, and *Dadimadi Ghrta* proved to be very much safe, effective, and tolerable in the management of IDA. No ADR/AEs pertaining to drug interaction were noticed during the trial period.

REFERENCES

1. De Mayor EM, Tegman A. Prevalence of anaemia in the world. Vol. 38. World Health Organisation; 1998. pp. 302-316.
2. Kalaivani K. Prevalence and consequences of anaemia in pregnancy. Indian J Med Res 2009 Nov;130(5):627-633.
3. Iron Deficiency Anaemia. Assessment, prevention and control. WHO/NHD/013, Chapter 2, p. 3.
4. Clark SF. Iron deficiency anaemia. Nutr Clin Pract 2008 Apr-May;23(2):128-141.
5. Dhatri Lauha: Sularogadhikara; p. 142-147, Bhaisajya ratnavali of Govinda Dasji Bhisagratna, Bhisagratna Shri Brahmasankar Mishra, editor. Commented by Shri Kaviraja Ambikadatta Sastri, 1st ed. Chaukhamba Sanskrit Bhavan.
6. Charaka Samhita, Chikitsa Sthana, Adhyaya 16 sloka Number 93-95, p. 530, Charaka Samhita with Deepika commentary of Chakrapanidatta, Vaidya Jadavaji Trikamji Acharya, editor. Chaukhamba Sanskrit Sansthan,
7. Charaka Samhita, Chikitsasthana, Chapter 16, Sloka Number 70-71, p. 530, Charaka Samhita with Deepika commentary of Chakrapanidatta, Vaidya Jadavaji Trikamji Acharya, editor. Chaukhamba Sanskrit Sansthan.
8. Dadimadi Ghrta – Charaka Samhita, Chikitsasthana, Chapter 16, Sloka Number 44-46, Charaka Samhita with Deepika commentary of Chakrapanidatta, Vaidya Jadavaji Trikamji Acharya, editor. Chaukhamba Sanskrit Sansthan.
9. Astanga Hridaya, Chikitsa Sthana, Chapter 16, Sloka 2-4, p. 702, Astanga Hridaya of Vagbhata with Sarvanga Sundara and Ayurveda Rasayana commentaries; collated by Dr Anna Moreswara Kunte and Krisna Ramachandra Sastri Navare and Bhisagacharya Harisastri Paradakara Vaidya, editor. Chaukhamba Orientalia, Varanasi.
10. Punarnavadi Mandura – Ayurvedic Pharmacopoiea of India – Part II, Vol. III, p. 132-134, 1st ed. Government of India, Ministry of Health and Family Welfare.
11. Navayasa Churna – API-Part II, Vol. I, p. 43, 1st ed. Government of India, Ministry of Health and Family Welfare.
12. Dhatri Lauha – Bhaisajya Ratnavali, Sularogadhikara, pp. 142-147, 1st ed. Government of India, Ministry of Health and Family Welfare.
13. Anaemia. Available from: http://www.klinikaikozpont.u-szeged.hu/pdf/CME_AN/7ANCL.pdf.
14. Hempel EV, Bollard ER. The evidence based evaluation of iron deficiency anaemia. Med Clin North Am 2016 Sep;100(5):1065-1075.

हिन्दी सारांश

लौहतत्वाल्पताजन्य पाण्डु में चयनित आयुर्वेद योगों की नैदानिक सुरक्षा

[1]बबीता यादव, [2]राजेश सण्ड, [3]बनमाली दास, [4]एच एम एल मीणा, [5]ओमराज शर्मा
[6]हरबंस सिंह, [7]बी आर मीणा, [8]एस के शर्मा, [9]वी बी कुमावत, [10]सोफिया जमीला
[11]प्रदीप दुआ, [12]जी सी भुयान, [13]श्रुति खंडूड़ी, [14]राकेश राणा, [15]प्रताप माखीजा
[16]ऋचा सिंघल, [17]आदर्श कुमार, [18]नारायणम श्रीकांत

भूमिका: पाण्डु एक ऐसी स्थिति है जिसमें लाल रक्त कोशिकाओं की संख्या या उनकी ऑक्सीजन परिवहन की क्षमता शरीरिक अवश्यकताओ को पूरा करने के लिए अपर्याप्त है। और ये अवस्था बहुत से लक्षणों को पैदा करती है। लौहतत्वाल्पताजन्य पाण्डु विश्वस्तर स्तर पर पांडुता का प्रमुख प्रकार है और यह शरीर में लौह तत्व की न्यूनता होने की कारण होती। आयुर्वेद में पांडु रोग के लक्षण प्रकार, सम्प्राप्ति और चिकित्सा के लिए अनेक औषधियाँ उपलब्ध है। उनमे से पुनर्नवादी मण्डूर, दाड़िमादि घृत नवायस चूर्ण एवं धात्री लौह मुख्यरूप से प्रयोग की जाती है। मगर इन योगो की सुरक्षा का मूल्यांकन परीक्षणों के माध्यम से अब तक नही हुआ है।

उद्देश्य: बहुकेन्द्रीय ओपन लेबल नैदानिक अध्ययन द्वारा शास्त्रीय आयुर्वेदिक योगों, जैसे, पुनर्नवादी मंडूर, दाड़िमादि घृत, नवायस चूर्ण और धात्री लौह की सुरक्षा एवं प्रभावकारी परिणामों का पाण्डु में विश्लेषण स्थापित करना।

साधन एवं सामग्री: केन्द्रीय अनुसंधान आयुर्वेद परिषद अधीनस्थ संस्थानों में पूर्ण किये गये तीन अलग–अलग नैदानिक अध्ययनों के आधार पर आंकड़ों का विश्लेषण किया गया। लौहतत्वाल्पताजन्य पांडुता में चार योगों अर्थात्, धात्री लौह, नवायस चूर्ण, पुनर्नवादी मंडूर और दाड़िमादि घृत की सुरक्षा परिगणन, करने के लिए मूल्यांकन किया गया। यह सुरक्षात्मक आंकलन यकृत कार्य परीक्षण (एलएफटी) एवं वृक्क कार्य परीक्षण (केएफटी) के परीक्षण अवधि से पूर्व व पश्चात किये गये आंकड़ों से किया गया है। इन योगों का सुरक्षा विश्लेषनात्मक परीक्षण (एल.एफ.टी.) एवं (के. एफ. टी.) को चिकित्सा प्रारम्भ करने के पूर्व तथा समाप्त होने पर जाँचा गया। प्रथम दिवस से अध्ययन अवधि पूर्ण पर औसत परिवर्तन में तुलना करने के लिये युग्मित नमूना टी–परीक्षण प्रयुक्त किया गया। इस अध्ययन से ज्ञात हुआ कि सभी मापदंड पूरी अध्ययन अवधि के दौरान निर्दिष्ट सीमाओं के भीतर थे। <0.05 का पी–मान महत्वपूर्ण माना जाता है। औषध अनुपालना में प्रतिकूल औषध प्रतिक्रिया या प्रतिकूल घटनायें, यदि कोई भी पाई जाती हैं, को भी एकत्रित किया गया।

निष्कर्ष: तीन विभिन्न नैदानिक अध्ययनों से पता चलता है कि पुनर्नवादी मंडूर, दाड़िमादि घृत, नवायस चूर्ण और धात्री लौह, लौहतत्वाल्पताजन्य पाण्डु में सुरिक्षत है। यह विभिन्न आयु समूहों, लिंग, भौगोलिक क्षेत्र व प्रकृति से जुड़े प्रतिभागियों के अच्छी तरह से नियोजित अनुसांधन अध्ययनों के परिणामों के माध्यम से समझा जा सकता है कि परीक्षण औषध ने समान रूप से सभी में अच्छा परिणाम दिया।

मुख्य शब्द: लौहतत्वाल्पताजन्य, दाड़िमादि घृत, पुनर्नवादी मंडूर।