OPEN RANDOMIZED CLINICAL TRIAL ON THE PANDU ROGA OF NISHALAUHAM SPECIFICALLY, ON HEMATOLOGICAL CRITERIA

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INTRODUCTION

Ayurveda, a unique part of Indian philosophy is really one of the great wonders of ancient Indian science. Ayurveda is not merely a health science, but it also reflects the genuine style of life. This is the first and foremost principle of Ayurveda. Ayurveda is most conscious about daily routine activities of human beings and so, extensively and elaborately described the ideal *Dinacharya.*[1] and its seasonal variation i.e., *Ritucharya.*[2]

The technology has made all the vegetables available throughout the year. Because of this, the percentage of nutritional components (i.e., the carbohydrates, proteins, vitamins and minerals) decreased up to the great extent. All the above conditions contribute to the malnourished Status especially in the higher and middle economic classes On the other hand, about 36.7% of the population are below poverty line in our country. They work hard throughout the day but could not get enough money to feed them and their family. They are also malnourished. They are bound to live in a dense population under unhygienic surroundings. Thus, we can conclude that the higher economic class and lower economic class all are malnourished under different circumstances. All these factors contribute and in turn leads to create very common and well-known disease "Pandu".

The peculiar colour presentation of the patient has been described by Acharyas as the colour of the patient is like the 'Ketaki-Raj' which is similar to the combination colour of white and yellow in a particular proportion.[3]

The disease Pandu has been widely and thoroughly described in all Ayurvedic Samhitas. References about this disease can be found since time immemorial [e.g.in Vedas, Garuda-Purana, Agni-Purana, Mahabharat, Valmiki Ramayan etc.) Malnutrition contributes significantly to the development of *Dhatu Aposhan.*[4] leading to *Bala* and *Ojakshaya.*[5]

Nishadi Lauham.[6] was taken from Bhaishajya Ratnavali Pandurogadhikar and Capsule of Ferrous Sulphate and Folic Acid from Modern science was selected for the present study.

MATERIAL AND METHODS

Design of study: Open Randomized clinical Trial.

Sample size: Total 60 patients were selected for study.

Aim: To study the effect of *Nishalauham* and cap ferrous sulphate and folic acid on the Panduroga.

Objective

Primary Objective

To evaluate the effect of *Nishalauham* on the *Panduroga* with that of capsule of Ferrous sulphate and Folic Acid.

Secondary Objective

1. To study the conceptual details of disease *Pandu*.

2. To study *Panduroga* according to ayurvedic and modern text.

Inclusion criteria[7]

1. *Nakha netra twak panduta* (Pallor)

2. *Agnimandya* (loss of appetite)

3. *Daurbalya* (Generalize debility)

4. *Shvas* (Dyspnoea)

5. *Hritspandan* (Palpitation)

6. *Jvara* (Fever)

7. *Akshikutashotha* (Oedema of eyelids)
8. *Karnakshveda* (Ringing in the ear)
9. *Pindikodveshtan* (Cramps in calf muscles)
10. *Padashotha* (Pedal oedema)

Laboratory investigations for diagnosis had been complete blood count, Total leucocyte count, Differential leucocyte count and peripheral smear for type of RBC's. Patients having haemoglobin levels between 7 to 10 gm% having iron deficiency anaemia had been included in the study.

Exclusion Criteria
1. Pregnant ladies had been excluded from the study.
2. Patients having severe anaemia i.e., haemoglobin less than 7gm% had been rejected.
3. Anaemia of chronic diseases, anaemia due to acute or chronic blood loss had been kept outside the study.
4. Anaemia other than iron deficiency had been excluded from the study.

Selection of drug
1. *Nishalauham.*
2. Cap Ferrous Sulphate and Folic Acid.

Criteria of Assessment
Criteria adopted for the assessment of therapy had been divided into following categories:
1. Clinical parameters
2. Haematological parameters.

1. Clinical Parameters[8]
First of all, diagnosed patients of *Panduroga* had been assessed with the help of score system of clinical features before treatment subjectively and objectively.

Clinical criteria assessment had been as follows
1. Nakha Netra Twak Panduta (Pallor)

No pallor	0
Mild pallor	1
Moderate pallor	2
Severe pallor	3

2. Agnimandya

Absent	0
Mild	1
Moderate	2
Severe	3

3. Daurbalya

Absent	0
Mild	1
Moderate	2
Severe	3

4. Shvas

No trouble by shortness of breath on level or uphill	0
troubled by shortness of breath on level or uphill	1
Walks slower than persons of same age	2
Stops after walking 100 yards	3

5. Hritspandan

Absent	0
Mild	1
Moderate	2
Severe	3

6. Jvara

Absent	0
Mild	1
Moderate	2
Severe	3

7. Akshikutashotha (oedema of eyelids)

Absent	0
Mild	1
Moderate	2
Severe	3

8. Karnakshveda (ringing in the ear)

Absent	0
Mild	1
Moderate	2

Severe	3

9. Pindikodveshtan (Cramps in calf muscles)

Absent	0
Mild	1
Moderate	2
Severe	3

10. Padashotha (Pedal oedema)

Absent	0
Mild	1
Moderate	2
Severe	3

2. Haematological Parameters

Haematological investigations such as haemoglobin estimation, total leucocyte count, differential leucocyte count and peripheral smear for type of RBC's had been carried out before treatment and at the end of the treatment of each patient.

Total Effect of Therapy

The effect of therapy had been evaluated under following five categories

1. Completely relieved

Patients having more than 75% relief in signs, symptoms and Hb% for Panduroga had been taken in this category.

2. Markedly Improved

A relief of 50% to 75% in the signs, symptoms and Hb% had been categorised under this group.

3. Improved

25% to 50% relief of sign and symptoms had been categorised in this group.

4. Unchanged

Signs and symptoms relieved below 25% and proved by laboratory investigations are considered in unchanged category.

5. L.A.M.A.

Patients leaving the treatment in between against medical advice had been considered as 'left against medical advice'.

OBSERVATION AND RESULT

Pandu is very common disease in the Indian society *Pandu*. Anaemia is a disease characterized by reduction in the Hb.gm. % and no. of RBC's/cumm. of blood there by reducing the oxygen carrying capacity of blood. Not only poverty and malnutrition play a vital role in its aetiology, but also several other etiological and predisposing factors like chronic intestinal worm infestation and malabsorption are similarly responsible for it. The aim of present study was to carry out and to study the effect of "*Nishalauham"* and capsule Ferrous sulphate and Folic acid on the *Panduroga*. *NishaLauham* was selected from *Bhaishajya Ratnavali Pandu Rogdhikara* which contains *Haridra, Daruharidra, Triphala, Kutaki and Loha bhasma.*

The whole study was performed in two groups.

1. Group A (Experimental Group) – Patients were treated with "*Nishalauham*"

2. Group B (Control Group)- Patients were treated with "Capsule of Ferrous Sulphate and Folic Acid".

The patients were assessed on different parameters for obtaining the effect of therapies. All the clinical signs and symptoms were assessed on the basis of scoring given to them before treatment (BT) and after treatment (AT). The general observations pertaining to age, sex, occupation etc of 60 patients of *Pandu* recorded in this series are discussed here.

Table 1: Effect of Therapy According to Haematological Investigations in 30 Patients of *Panduroga* in Experimental Group.

Sr. no.	Clinical Parameter	BT	AT	Mean Change	't' Value	'p' Value
1	Hb%	8.82±0.62	9.85±0.77	1.03±0.96	5.8712	0.0001**
2	TLC	7353.33±1858.01	6980±1618.72	-373.3±213.62	0.9584	0.345+
3	Neutrophil	62.63±10.26	58.63±10.72	-4±10.99	1.9926	0.0558+
4	Lymphocyte	31.46±9.27	28.96±9.64	-2.5±7.02	1.9503	0.0609+
5	Monocytes	4.1±1.82	2.7±1.17	-1.4±1.95	3.9159	0.0005**
6	Eosinophils	3.9±1.32	2.7±1.12	-1.2±1.24	5.2881	0.0001**
7	ESR	29.7±9.12	25.73±6.65	-3.96±9.25	2.3480	0.0259,S
8	MCV	66.32±3.73	69.05±3.44	2.73±1.75	8.5510	0.0001**
9	MCH	17.95±2.26	20.08±2.80	-3.12±1.99	5.8327	0.0001**
10	MCHC	26.47±3.12	28.66±3.77	2.18±2.11	5.6663	0.0001**

(+ Non- significant, S Significant, ** Highly significant)

Haemoglobin: The mean score of Hb % before treatment was 8.82±0.62 and after treatment it was 9.85±0.77 which was statistically significant. (P<0.001). The mean change was 1.03±0.96.

MCV: The mean score of MCV before treatment was 66.32±3.73 and after treatment 69.05±3.44 which was statistically significant (P< 0.0001). The mean change was 2.73±1.75.

Mean corpuscular haemoglobin: The mean score of MCH before treatment was 17.95±2.26 and it became 20.08±2.80 after treatment. Which was statistically significant(P<0.0001). The mean change was -3.72±1.99.

MCHC: The mean score of MCHC before treatment was 26.47±3.12 and it became 28.66±3.77 after treatment which was statistically significant (P<0.0001). The mean change was 2.18±2.11.

ESR: The mean score of ESR was 29.7±9.12 before treatment, which was decreased up to 25.73±6.65 after treatment which shows significant result statistically. (P<0.0259) statistically highly significant (P<0.05) The mean change was -3.96±9.25.

TLC (Total Leucocyte Count): The mean score of TLC before treatment was 7353.33±1858.01 and after treatment 6980±1618.02 which was statistically non-significant (P<0.3458). The mean change was -373.33±2133.62.

Neutrophils: The mean score of Neutrophils before treatment was 62.63±10.26 and after treatment 58.63±10.72 which was statistically non-significant (P<0.0558). The mean change was -4±10.99.

Lymphocytes: The mean score of Lymphocytes before treatment was 31.46±9.27 and after treatment 28.96±9.64 which was statistically non-significant (P<0.0609). The mean change was -2.5±7.02.

Monocytes: The mean score of Monocytes before treatment was 4.1±1.82 and after treatment 2.7±1.17 which was statistically highly significant (P<0.0005). The mean change was -1.4±1.95.

Eosinophils: The mean score of Eosinophils before treatment was 3.9±1.32 and after treatment 2.7±1.12 which was statistically non-significant (P<0.0005). The mean change was -1.2±1.24.

Table 2: Effect of Therapy According To Haematological Investigations In 30 Patients of *Panduroga* In Control Group.

Sr No.	Clinical Parameter	BT	AT	Mean Change	't' Value	'p' Value
1	Hb%	8.42±0.79	9.49±0.8	1.07±0.59	9.8612	0.0001
2	TLC	6616.67±1790.22	7030±1254.27	413.33±1460.21	1.5504	0.1319
3	Neutrophil	62.06±8.37	64.9±9.94	2.83±1.38	2.0498	0.0495
4	Lymphocyte	33.4±9.34	37.56±8.86	4.16±10.45	2.1821	0.0053
5	Monocytes	4.16±1.28	2.83±1.17	-1.13±1.26	5.7570	0.0001
6	Eosinophils	3.53±1.30	2.86±1.19	-0.66±1.80	2.0210	0.0526
7	ESR	29.26±9.29	23.23±6.65	-6.03±7.28	4.5363	0.0001
8	MCV	64.43±5.87	67.8±5.73	3.36±1.62	11.3190	0.0001
9	MCH	17.21±2.46	21.26±2.63	4.04±1.38	15.9607	0.0001
10	MCHC	25.94±2.86	30.74±3.50	4.79±1.85	14.1262	0.0001

Haemoglobin: The mean score of Hb before treatment was 8.42±0.79 and after treatment it was 9.49±0.8 which was statistically Non-significant (P<0.8599).

MCV: The mean score of MCV before treatment was 64.43±5.87 and after treatment 67.8±5.73 which was statistically highly significant (P< 0.0001).

MCH: The mean score of MCH before treatment was 17.21±2.46 and it became 21.26±2.63 after treatment which was statistically highly significant (P<0.0001).

MCHC: The mean score of MCHC before treatment was 25.94±2.86 and it became 30.74±3.50 after treatment which was statistically highly significant (P<0.0001).

ESR: The mean score of ESR was 29.26±9.29 before treatment, which was decreased up to 23.23±6.65 after treatment. Which shows highly significant result statistically. (P<0.0001)

TLC (Total Leucocyte Count): The mean score of TLC before treatment was 6616.67±1790.22 and after treatment 7030±1254.27 which was statistically non-significant (P<0.1010). The mean change was 413.33±1460.21.

Neutrophils: The mean score of Neutrophils before treatment was 62.06±8.37 and after treatment 64.9±9.94 which was statistically significant (P<0.0495). The mean change was 2.83±1.38.

Lymphocytes: The mean score of Lymphocytes before treatment was 33.4±9.34 and after treatment 37.56±8.86 which was statistically significant (P<0.0374). The mean change was 4.16±10.45.

Monocytes: The mean score of Monocytes before treatment was 4.16±1.28 and after treatment 2.83±1.17 which was statistically highly significant (P<0.0001). The mean change was -1.13±1.26.

Eosinophils: The mean score of Eosinophils before treatment was 3.53±1.30 and after treatment 2.86±1.19 which was statistically non-significant (P<0.0526). The mean change was -0.66±1.80.

Table 3: Comparison of Effect of Therapy According To Haematological Investigations in 60 Patients of Panduroga in Control Group.

Sr.no.	Clinical Parameter	Experimental Group (Mean±SD)	Control Group (Mean±SD)	'Z' Value	'p' Value
1	Hb%	1.03±0.96	1.07±0.59	0.208	0.8356,+
2	TLC	-373.33±2133.62	413.33±1460.21	1.938	0.0527,+
3	Neutrophil	-4±10.99	2.83±1.38	3.014	0.0026, **
4	Lymphocyte	-2.5±7.02	4.16±10.45	2.837	0.0046,**
5	Monocytes	-1.4±1.95	-1.13±1.26	0.508	0.6118, +
6	Eosinophils	-1.2±1.24	-0.66±1.80	1.049	0.2944, +
7	ESR	-3.96±9.25	-6.03±7.28	1.125	0.2607, +
8	MCV	2.73±1.75	3.36±1.62	1.714	0.0865, +
9	MCH	-3.12±1.99	4.04±1.38	4.691	0.0001, **
10	MCHC	2.18±2.11	4.79±1.85	4.498	0.0001, **

(+ Non significant, S significant, ** Highly significant)

All clinical parameters were compared before and after treatment by paired 't' test. Changes in clinical parameters in experimental and control groups were compared by Mann-Whitney test.

All the test were 2-sided p<0.05 was considered as statistical significance. Data was analysed using statistical software (Data Version 10.0).

Haemoglobin: Values in clinical parameters in experimental and control groups were1.03±0.96, 1.07±0.59 respectively which shows statistically non-significant (p<0.8356).

MCV: Changes in clinical parameters in experimental and control groups were 2.73±1.75, 3.36±1.62 respectively which shows statistically non-significant (p<0.0865).

MCH: Changes in clinical parameters in experimental and control groups were -3.12±1.99, 4.04±1.38 respectively which shows statistically highly Significant (p<0.0001).

MCHC: Values in clinical parameters in experimental and control groups were -2.18±2.11, 4.79±1.85 respectively which shows statistically highly Significant (p<0.0001).

ESR: Values in clinical parameters in experimental and control groups were -3.96±9.25, -6.03±7.28 respectively which shows statistically Non-significant (p<0.2607).

TLC (Total Leucocyte Count): Values in clinical parameters in experimental and control groups were -373.33±2133.62, 413.33±1460.21respectively which shows statistically non-significant (p<0.0527).

Neutrophils: Values in clinical parameters in experimental and control groups were -4±10.99, 2.83±1.38respectively which shows statistically highly Significant (p<0.0026).

Lymphocytes: Values in clinical parameters in experimental and control groups were -2.5±7.02, 4.16±10.45respectively which shows statistically highly Significant (p<0.0046).

Monocytes: Values in clinical parameters in experimental and control groups were -1.4±1.95,-1.13±1.26respectively which shows statistically non-significant (p<0.6118).

Eosinophils: Values in clinical parameters in experimental and control groups were -1.2±1.24,-0.66±1.80respectively which shows statistically non-significant (p<0.2944).

Table 4: Table Showing Total Effect of Therapy in 60 Patients Of Panduroga Vis-À-Vis Iron Deficiency Anaemia.

Sr.no.	Category	Experimental Group		Control Group		Total no. of Patient	Percentage
		No. of Patient	Percentage	No. of Patient	Percentage		
1	Completely Relieved i.e.≥75%	00	00	00	00	00	00
2	Markedly Improved i.e.50-75%	12	40%	08	26.66%	20	33.33%
3	Improved i.e.25-50%	17	56.66%	20	66.66%	37	61.66%
4	Unchanged i.e.≤25%	01	03.33%	02	06.66%	03	05%
5	LAMA	00	00	00	00	00	00

The above table shows the overall effect of therapy and reveals that in experimental Group no patients had >75% relief, 40% patients were markedly improved and 17 patients (56.66%) were improved. While one patient (3.33%) was having no improvement i.e. unchanged category.

In Control group – no patients had >75% relief, 08 patient (26.66%) had marked improvement, 20 patients (66.66%) had improvement and only 2 patients (6.66%) were having no improvement.

In overall effect of therapy there is no patient had ≥ 75% relief, 20 patients (33.33%) had markedly improved, 37 Patient (61.66) had improvement and 03 (05%) patients were having no improvement. There is no LAMA.

CONCLUSION

- *Panduroga* is *Pitta pradhana vyadhi, Pitta* is responsible for the normal colour of the body but when it gets vitiated, the *Rakta* as it happens in *Panduroga* and thus loss of complexion or *Panduta* occurs.

- *Panduroga* is also considered as *Santarpanjanya vyadhi*, which broadly means Anabolism, brings about an increase in *kapha* which in term may cause the disease by generating *Aam* and *Mandagni* (Cha. Su.23/5). Thus, any diet which may increase *kapha* o any disease associated with increase in *kapha* can cause a change in complexion or *Panduroga.*

- Though *Pitta* is *pradhana dosha* in *Panduroga*, *Vata dosha* also plays crucial role in manifestation of *Panduroga*, mainly *Vyana vayu* has a relation with *Samprapti* of *Panduroga.*

- *Panduroga* can be effectively compared with Anaemia on the grounds of its similar signs and symptoms.

- In the modern medicine, there is good treatment for anaemia with considerable result but that is only for acute deficiency anaemias, no significant therapy is there for chronic anaemias which occurs due to metabolic defects. So, Ayurveda can provide better management of this.

- It is obvious that Anaemia is most common among females due to menstruation, poor general health, improper and inadequate diet which leads to malnutrition leading to Anaemia.

- In present study mostly Microcytic Anaemia was found, size of RBCs is smaller than the normal. And in IDA is type of Microcytic Anaemia.

- In Anaemia Iron deficiency is the most commonly found and main cause of Iron deficiency is improper Iron absorption in the GIT.

- Ferrous iron can absorb better than Inorganic ferrous and ferric salts. Haemoglobin iron is absorbed intact as haeme, even at neutral pH, and is not affected by dietary maintains the phosphate and phytate.

- Regarding the trial compounds, Majority of drugs in *'NISHA LAUHAM'* are having *tikta rasa*, and specific action of *Tikta rasa* is *deepan, pachana*. So, drug increases the *Jatharagni* and *Dhatvagni* up to normal level and *Dhatunirman* process gets toned up which results ultimately to *Dhatu pushti* and *Dhatu prasadana.*

- *Amalaki* is main trial compound, it contains high amount of Vitamin C, which reduces ferric iron to ferrous iron which remains soluble even at neutral pH and is better absorbed. Even when the diet is poor in iron, Vitamin C supplement with each meal enhance iron absorption. Vitamin C taken in divided doses with each meal will increase iron absorption to a greater extent.

- In the present study, total 60 patients were registered out of which 30 patients were completed the treatment in Experimental Group, in Control Group B, total 30 patients were registered and No LAMA.

- Maximum patients i.e., 51.66% were belong to *Tarunavastha* (17-40 years) age group.

- Maximum i.e., 88.33% patients were female, majority i.e whereas 41.66% patients were belonging to lower middle class and 68.33% were house -holder.

- Maximum i.e., 36.66% patients were having lower school education, 70% patients were Hindu.

- Majority of the patients 58.33% were taking Madhur Rasa, whereas 41.66% were taking Katu Rasa in their diet. Majority of the patients 31.66% were taking snigdha aahara and Addiction of tea was found mostly i.e., 75 % patients.

- 68.33% patients were having Vata-Pitta Prakriti. 58.33% were of Madhyama Samhanana, 78.33% of Madhyama Satva, 53.33% of Avara Satmya, 71.66% of patients taking madhyama aahara praman.

DISCUSSION

It would not be an exaggeration if it is said that every Indian is anaemic especially if they are females. Every stage of life faces a spell of anaemia, be it a milk fed baby, years of growth spurt or females of menstruating age or be it a senile period. Everyone has come across, sometime in his life, this disease in anyway. Ayurveda emphasizes that diet plays pivotal role in building body material and it is also equally important in genesis of diseases [9]. In India, maximum population is from low-income group. They are illiterate about the importance of balanced diet. The brunt of *Pandu* is mainly on females. *Pandu Roga* is a disease characterized by pallor of body which strikingly resembles with 'Anaemia' of Modern science, disease referring to reduction in no. of RBCs per cumm. Of blood and quantity of Hb resulting in pallor like other symptoms. *Pandu Roga* can be effectively compared with Anaemia on the grounds of its similar signs and symptoms.

In the modern medicine, there is good treatment for Anaemia with Considerable result but that is only for acute deficiency Anaemia, no significant therapy is there for chronic Anaemia which occurs due to metabolic defects. So, Ayurveda can provide better management of this.

The world's population is increasing at a rapid rate, with the result most of the people are living in unhygienic, under-nourishing conditions and facing various effects of stress and strain factor. Illiteracy is also a problem in developing countries like India due to which great majority of people are living under poverty line, who cannot get quantitatively sufficient diet. Even pregnant ladies don't get proper nourishment due to which mother and infant mortality is at higher level. Though always not having very serious effect, the disease causes extreme

debility as the symptoms like _Hridspandanana_ (Palpitation), _Swasha_ (Dyspnoea on exertion) etc. follows with the progression of disease. In starting there is physiological adaptation and the patient do not bother, but after some time due to long lasting of disease, metabolic defects occur due to which there is emaciation and wasting of body and a feeling of sickness is always there with the patient.

In the language of 'Ayurveda'we can say "_Dhatukshaya_ "occurs which then leads to "_Ojokshaya_". That's why our Acharyas has mentioned '_Hatanala''Hatendriya'_ etc. as the _lakshana_ of _Pandu Roga._

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