



Case Study

EFFECTIVENESS OF MULTIMODAL AYURVEDIC TREATMENT IN VATAJA PANDU W.S.R  
NUTRITIONAL DEFICIENCY ANEMIA - A CASE REPORT

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ABSTRACT

*Panduroga* is a condition where in *Pitta Pradhana Tridoshas* affect the *Dhathus* causing deterioration of *Varna* and *Bala*, leading to *Twak Vaivarnyatha* or *Pandutha*. In present day medical science, symptoms of *Pandu* are alike to that of anaemia. Anemia is a condition presenting with a depletion of hemoglobin concentration below normal values, or Hematocrit or Red blood cells in the blood. On an average, about 30% or nearly one third of world's population is claimed to be affected by anemia because of numerous causes. In India prevalence is extremely high compared to world prevalence, close to 51%. Nutritional macrocytic anemia (NMA) in prevailing population and in pregnancy, commonly seen in India, most likely represents combined deficiency of iron, folic acid and vitamin B12. A 45 years old female presented with complaints of *Panduta* (Pallor of skin), *Daurbalya* (weakness), *Aruchi* (loss of appetite), *Padashopha* (pedal oedema), *Pindikodweshtana* (leg cramps), *Shrama Shwasa* (exertional dyspnoea) and *Hridhrava* (palpitation) with haemoglobin concentration 3.7gm% visited OPD of SJIIM, GAMC, Bengaluru. Initially she was started with oral medications followed by admission to in-patient ward on the succeeding visit. The present case study is intended to understand the accuracy of multimodal Ayurvedic approach consisting of oral medications and *Matra Basti* with *Dadimadya Ghrita*, in the management of *Panduroga* and is found to be effective in overcoming *Vataja Pandu*.

INTRODUCTION

*Pandu* can be understood as *Pitta Dosha Pradhan Vyadhi* associated with *Rasa* and *Rakta Dhatu* (lymph and blood tissue). *Bhrajaka Pitta* is responsible for the normal *Varna* of *Twak* (skin). The changing lifestyle of human being by means of *Ahara* and *Vihara* (diet and lifestyle) plays an important role in the manifestation of *Pandu*. Irregular/faulty *Pitta Prakopaka* dietary habits and lifestyle like *Amla*, *Lavana*, *Katu Rasa Atisevana*, *Kshara*, *Ushna*, *Tisksna*, *Ruksha Ahara Atisevana*, impairs the digestion, leading to *Mandagni*. *Pitta Dosha* further gets aggravated. Aggravation of *Pitta* causes vitiation of *Rasa Dhatu-Gauravata* and *Shaithilyata* in *Dhatu*, and *Bala*, *Varna*, *Sneha* of *Twak* gets affected.

There is impaired *Prasada Bhaga* of *Rasa Dhatu* which leads to depletion in quality of *Uttarottara dhatu*, especially *Rakta Dhatu*.

Symptoms of *Panduroga* are, *Karna Kshveda* (tinnitus), *Ajeerna* (loss of digestive power), *Daurbalya* (Debility), *Sadana*, (malaise) *Annadvesha* (aversion to food), *Shrama* (exhaustion), *Ruk* (pain) in whole body are also seen. *Vataja Pandu* in specific is characterized by *Krishna-pandutvam* (pale discoloration of skin) and *Ruksha Angata* (dryness of skin). Its other symptoms are *Angamarda* (malaise), *Ruja* (ache), *Toda* (pricking pain), *Kampa* (tremor), *Parshwa Ruja* (pain in flanks), *Shiroruja* (headache); *Varcha shosha* (dried feces), *Asya Vairasya* (distaste in the mouth); *Shopha* (swelling), *Anaha* (gaseous distention of the abdomen) and *Balakshaya* (weakness)<sup>[1]</sup>. The treatment principle of *Pandu Roga* comprises both *Shamana* and *Shodhana*. In *Bahudoshavastha Teekshna Shodhana* is indicated. In *Alpa* and *Madhyama Dosha avastha Shamana* is ideal. *Vataja Pandu Lakshanas* can be specifically correlated to Nutritional Deficiency Anemia. Anemia refers to a

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condition presenting with a depletion of hemoglobin concentration below normal values, or Hematocrit or Red blood cells in the blood. Any of those three measures (Hemoglobin, Hematocrit, or number of red cells) may be used to for the diagnosis of anemia, however the blood hemoglobin level is usually most popular, thanks to its of its accuracy and reliability.

In present scenario according to WHO, anaemia is very common in general population and around 2 billion people are suffering from anaemia across the world, which corresponds to 24.8% of the population<sup>[2]</sup>. In India prevalence is very high as compared to world prevalence which is approximately 51%. In majority of the cases, anemia is caused by multiple factors– Iron deficiency, Vit B12 deficiency, folic acid deficiency and so on.

- Deficiency of Iron-manifested by microcytic hypochromic anemia with hyper cellular bone marrow.<sup>[3,4]</sup>
- Deficiency of folic acid and/or vitamin B12-manifested by macrocytic anemia and a hyper cellular bone marrow with megaloblast, giant cells, metamyelocyte and abnormal megakaryocyte.
- Nutritional Macrocytic Anemia (NMA) which is the most common cause of anemia in India in general population and in pregnancy<sup>[5]</sup>, probably represents combined deficiency of iron, folic acid and vitamin B12 <sup>[6,7,8,9]</sup>.

### Case Report

A 45 years old female patient, Tailor by occupation visited the Outpatient Department of Panchakarma, SJIIM, GAMC, Bengaluru during the month of August 2021 presenting with symptoms of loss of appetite, nausea, excessive tiredness, muscle cramps, breathlessness on exertion, swelling of bilateral feet and palpitation since around 4 months. The patient was apparently normal before 4 months. Since then, she gradually experienced excessive tiredness after returning from work. She started developing muscle cramps and shortness of breath on doing minimum physical activities which worsened day by day. Since 2 months she complains of bilateral pedal edema. Additionally, she also complains of loss of appetite and palpitation. Past history revealed that she is not a known case of DM, HTN or any Thyroid Dysfunction. No members in family have similar complaints. Menstrual history is scanty and irregular. She belongs to lower middle class socio economic community and was cooperative. Her bowel habits were irregular and constipated, frequency of urine was 4-5 times/day and once at night, sleep was moderate. She used to control the urge of defecation and micturition regularly since about 20 years due to nature of her work. She was habituated to skipping afternoon meals and occasionally breakfast as well. Diet pattern was mixed with frequent use of dried fish.

Her weight is 40kg with a height of 150cm and BMI of 17.77. Patient had already consulted many doctors, where she was diagnosed with anemia with Haemoglobin levels of 3.7gm%. She had taken oral medicines for 2 months but had not found much relief. She was suggested for blood transfusion but was unwilling for the same. *Ashta vidha Pariksha, Dashavidha Pariksha*, general physical examination and systemic examination was done as mentioned in Table 1, Table 2, Table 3, Table 4 and Table 5. Peripheral blood smear revealed Macrocytic hypochromic anemia. Considering the symptoms and lab investigations, patient was diagnosed with *Vataja Pandu*. Reg details - OPD No 22816, IPD No 541

**Table 1: General Physical Examination**

Appearance	Ill look
Consciousness	Alert
Built	Hyposthenic
Gait	Reduced Mobility
Pallor	Present
Icterus	Absent
Clubbing	Absent
Cyanosis	Absent
Lymphadenopathy	No palpable lymph nodes
Edema	Pedal edema

**Table 2: Systemic Examination**

CNS	Higher Mental Functions – Intact, Orientation to time, place, person – intact, Motor and sensory system- intact
RS	Trachea centrally placed, Chest bilaterally symmetrical, Air entry bilaterally equal, NVBS heard
CVS	S1S2 heard, tachycardia +
GIT	Tongue- Pale, smooth texture, no dental caries, P/A – soft, no palpable mass

**Table 3: Vitals**

Pulse	98 bpm
RR	19/min
BP	110/70 mm Hg
Temp	98.4 F

**Table 4: Ashtasthana Pariksha**

<i>Nadi</i>	<i>Vegavati</i>
<i>Mutra</i>	<i>Ishat Peeta Varna</i>
<i>Mala</i>	<i>Baddha, Shushka</i>
<i>Jihwa</i>	<i>Pandu varna, Lipta</i>
<i>Shabda</i>	<i>Deena</i>
<i>Sparsha</i>	<i>Sheeta Sparsha</i>
<i>Druk</i>	<i>Pakruta</i>
<i>Akriti</i>	<i>Krusha</i>

**Table 5: Dashavidha Pariksha**

Prakriti	Vata - Pittaja
Vikriti	Pitta Pradhana Tridosha
Sara	Madhyama
Samhanana	Madhyama
Satmya	Madhyama
Satva	Pravara
Ahara Shakti	Abhyavaharana Shakti - Avara, Jarana Shakti - Avara
Vyayama Shakti	Avara
Pramana	Madhyama
Vaya	Madhyama

**Grading of Symptoms**

For the purpose of statistical assessment of results some grades and grade points considering the severity of different clinical features have been used as mentioned below in Table 6 and Table 13.

**Table 6: Pandutha**

Pandutha present in Nayana, Twak, Jihwa, Mootra & Pureesha

Not present	0
Present in any one site	1
Present in 2 or 3 sites	2
Present in 4 to 6 sites	3

**Table 7: Pindikodweshtana**

Not present	0
Mild leg cramps only at night	1
Leg cramps present in night or on exertion, requiring medical aid	2
Leg cramps present throughout the day	3

**Table 8: Shwasa**

Not present	0
Shwasa on heavy work	1
Shwasa on moderate work	2
Shwasa on light work	3

**Table 9: Agnisada**

Not present	0
Present, hungry dislike food	1
Present, doesn't hamper daily activity	2
Present, hamper daily activity	3

**Table 10: Daurbalya**

Not present	0
Daurbalya present, routines not hampered	1
Daurbalya present, routines hampered	2
Daurbalya always present, routines hampered	3

**Table 11: Aruchi**

Absent	0
Occasional	1
Intermittent	2
Present always	3

**Table 12: Hridrava**

No Palpitation	0
Palpitation on Unaccustomed activity	1
Palpitation on accustomed activity	2
Palpitation at rest	3

**Table 13: Arohanayasa**

Absent	0
Stepping up to >20 steps	1
Between 10-20 steps	2
Less than 10 steps	3

**Treatment plan**

Patient was started with oral medications initially for a period of 15 days - with *Kamadugha Rasa* 1TID before food, *Punarnava Mandoora* 2TID after food, Syr.4Blud 15ml BD after food. There was improvement in haemoglobin level from 3.7gm% to 4.2 gm% during this period. On her next visit, she was advised admission to in-patient ward. *Arogyavardhini Vati* 1TID after food, *Punarnava Mandoora* 2TID after food, *Kamadugha Rasa* 1TID before food was given for 7 days. During this period, there was complete remission of pedal edema, improvement in appetite and relief from nausea completely. *Dhatri Loha* 2TID was added with the above medicines for a period of 7 days more. Hemoglobin level was found to be 4.7gm% after this period. After assessing patient condition, *Sarvanga abhyanga* with *Ashwagandha Balalakshadi Taila* followed by *Mridu sweda* was advised for 7 days. Patient found relief in generalized weakness and muscle cramps. Next, *Matra Basti* with *Dadimadya Ghrita* 30ml with 1gm *Loha Bhasma*, 5gm *Shatapushpa churna*, 1gm *Saindhava Lavana* was administered for a period of 14 days. Retention time of *Basti dravya* progressively increased from 3 hours to 18 hours by the end of 14 days. Hemoglobin levels were assessed and were found to be 6.2gm%. She was now able to walk freely without breathlessness, there was improved appetite, bowels were regular and interest in daily activities. The treatment was further continued for 7 days and the patient was discharged. On discharge, she was advised with *Dhatri Loha* 2TID after food, *Punarnava Mandoora* 2BD after food, *Arogyavardhini Vati* 1TID after food, Syr. 4Blud 15ml after food, *Dadimadya Ghrita* 10ml BD before food for a period of 1 month, along with advise on *Pathya-Apathya*. Hemoglobin levels was tested to be 8.8gm%. The same treatment was continued for a period of 25 days and presently the haemoglobin levels are at 10.2gm%. Her weight has also increased from initial 40kg to present 45kg with BMI from 17.77 to present 20. Patient did not complain of any sort of discomfort

during and after the drug administration. None of the or constipation. treatment modalities caused any gastric disturbances

**Table 14: Treatment Given**

Period	Treatment Given	Results
17 Aug 2021 - 31 Aug 2021	<i>Kamadugha Rasa</i> 1TID B/F, <i>Punarnava Mandoora</i> 2TID A/F, Syr. 4Blud 15 ml BD A/F	Increase in hemoglobin level from 3.7gm% to 4.2gm%
01 Sep 2021 - 07 Sep 2021	<i>Arogyavardhini Vati</i> 1TID A/F, <i>Punarnava Mandoora</i> 2TID A/F, <i>Kamadugha Rasa</i> 1TID B/F	Complete remission of pedal edema, improvement in appetite and relief from nausea
08 Sep 2021 - 15 Sep 2021	<i>Arogyavardhini Vati</i> 1TID A/F, <i>Punarnava Mandoora</i> 2TID A/F, <i>Kamadugha Rasa</i> 1TID B/F, <i>Dhatri Loha</i> 2TID A/F	Increase in haemoglobin level from 4.2gm% to 4.7gm%
16 Sep 2021 - 21 Sep 2021	<i>Sarvanga abhyanga</i> with <i>Ashwagandha Balalakshadi Taila</i> followed by <i>Mridu sweda</i>	Relief in generalized weakness and muscle cramps, bowels regular
22 Sep 2021 - 13 Oct 2021	<i>Sarvanga abhyanga</i> with <i>Ashwagandha Balalakshadi Taila</i> followed by <i>Mridu sweda Matra Basti</i> with <i>Dadimadya Ghrita</i> 30 ml with 1gm <i>Loha Bhasma</i> , 5gm <i>Shatapushpa churna</i> , 1gm <i>Saindhava Lavana</i>	Increase in haemoglobin level from 4.7gm% to 6.2gm%. Improvement in retention period of <i>Basti dravya</i> from 3 hrs to 18 hrs Regular bowels with soft consistency, reduced weakness
14 Oct 2021 - 16 Nov 2021	<i>Dhatri Loha</i> 2TID A/F, <i>Punarnava Mandoora</i> 2BD A/F, <i>Arogyavardhini Vati</i> 1TID A/F, Syr. 4Blud 15ml A/F, <i>Dadimadya Ghrita</i> 20ml BD B/F	Increase in haemoglobin level from 6.2gm% to 8.8gm%
17 Nov 2021 - 14 Dec 2021	<i>Dhatri Loha</i> 2TID A/F, <i>Arogyavardhini Vati</i> 1TID A/F, Syr. 4Blud 15ml A/F, <i>Dadimadya Ghrita</i> 20ml BD B/F	Increase in haemoglobin level from 8.8gm% to 10.2gm% Increase in weight from initial 40kg to present 45kg with BMI from 17.77 to present 20.

**Table 15: Assessment of subjective parameters before, during and after treatment with scores**

Parameters	17 Aug 21	15 Sep 21	13 Oct 21	16 Nov 21	14 Dec 21	Relief in %
<i>Panduta</i>	2	2	1	1	0	100
<i>Pindikodweshtana</i>	3	3	2	1	0	100
<i>Shwasa</i>	3	3	2	1	1	75
<i>Agnisada</i>	3	2	1	0	0	100
<i>Daurbalya</i>	3	2	1	0	0	100
<i>Aruchi</i>	3	2	0	0	0	100
<i>Hridrava</i>	2	1	1	0	0	100
<i>Arohanayasa</i>	3	3	2	1	1	75
Total Score out of 24	22	18	10	4	2	90.9

**Laboratory Assessment**

The following laboratory findings had been assessed before, during, and after treatment, as mentioned in table 16:

1) Total RBC count, 2) blood hemoglobin level, 3) HCT, 4) MCV, 5) MCHC, 6) MCH, 7) RDW

**Table 16: Assessment of different haematological parameters before, during and after treatment**

Parameters	17 Aug 21	15 Sep 21	13 Oct 21	16 Nov 21	14 Dec 21
Total RBC Count in 10 <sup>6</sup> /uL	0.85	1.11	1.50	2.6	3.4
Haemoglobin	3.7 gm%	4.7 gm%	6.2 gm%	8.8 gm%	10.2 gm%
HCT	10.1 %	12.2%	15.3%	26.4%	30.6 %
MCV	118.8 fL	110.1 fL	102.0 fL	101.5 fL	90.0 fL
MCHC	36.6 gm/dL	38.5 gm/dL	40.5 gm/dL	33.3 gm/dL	33.3 gm/dL
MCH	43.5 pg	42.3 pg	41.3 pg	33.8 pg	30.0 pg
RDW	12.9%	11.7%	13%	11.7%	12.2%

## DISCUSSION

Though both the genders are susceptible to the affliction of anemia, it is more common in females. Women of reproductive age i.e., during 15–49 years are particularly at increased risk of nutritional deficiency and, therefore, anemia, compared to men, due to physiological changes such as menstruation (blood loss pathway), pregnancy (inadequate production pathway due to increased demand) and bleeding in childbirth, is more prevalent in females. Additionally, unequal household food allocation can make women vulnerable to anemia as they might not have access to nutrition-rich foods<sup>[10]</sup>. Families of poor income group are unable to afford proper diet and due to improper and imbalanced diet, women of those families may easily suffer from nutritional deficiencies<sup>[11]</sup>. In accordance to Ayurveda, inadequate functioning of *Agni* is the primary reason behind all ailments. Patient in this study suffered from *Mandagni* and had *Krura Koshta*. Consumption of inadequate nutrition due to *Mandagni* leads to inanition, which worsens the disease. *Krura Koshta* having dominance of *Vata* results in improper digestion, and insufficient absorption, furthermore deteriorates the condition of malnutrition.

After 3 months of intervention with Ayurvedic drugs there was marked improvement observed in the clinical features as well in the haemoglobin levels. *Matra basti* is always useful for persons emaciated by excess activities and for person who are weak and afflicted with *Vatika* disorders. *Matra Basti* can be administered safely in any season. Throughout the course of this treatment, the patient is allowed to continue his routine diet and activities with none restrictions. *Matra basti* helps in improving physical strength and helps in easy evacuation of stool. It improves nourishment and cures diseases caused by aggravated *vata*<sup>[12]</sup>. After administration of *Matra Basti* with *Dadimadya Ghrita*, relatively quicker enhancements were observed in the clinical features such as pallor, anorexia, weakness, fatigue, irritability, etc and evident changes were also observed in haematological parameters, than compared to initial improvement with solely oral medications.

### Discussion on Treatment Adopted

***Dadimadya Ghrita*:** In *Pandu*, there's predominant derangement of *Pitta Dosha*. *Dadima* (*Punica granatum* Linn.) by virtue of *Madhura* (sweet) and *Kashaya* (astringent) *Rasa* acts as *Pitta Shamana*. *Dhanyaka* possesses *Deepana* (appetizer) and *Pachana* (carminative) properties alongside *Chitraka* acts as *Agnimandyahara* (cures weak digestion) that helps to disintegrate *Dosha-dushya samurchana*. *Chitraka* (*Plumbago zeylanica*) holds *Tikshna*, *Laghu*, *Ruksha guna*; *Katu*, *Tikta rasa*, *Katu vipaka* and *Ushna veerya*. Attributing to it, it alleviates *Kapha-vata*, and will

increase *Pitta*. Since here it's processed with cow ghee, its *Pitta vardhaka* property is reduced. It enhances the secretions of mucus membrane of stomach and helps for digestion and absorption. *Shunthi* (*Zingiber officinalis* Roscoe) has *Laghu* and *Snigdha guna*; *Katu rasa*; *Madhura vipaka* and *Ushna veerya*. Its use has been described in *Pandu* by *Bhavaprakasha*. It is *Deepana* and *Pachana*, so acts as *Amapachaka* (digests *ama*). It functions as a good blood purifier, improves circulatory system and cardio vascular system. *Pippali* (*Piper longum* Linn.) possesses *Laghu*, *Snigdha* and *Tikshna guna*, *Katu rasa*, *Madhura vipaka* and *Anushna sheeta veerya*. Therefore it balances *Kapha-vata*. It aids in resurrection of *Rakta dhatu*. As explained in *Charaka Samhita*, *Ghritha* is possesses the property of *Pitta-Anilahara*, promotes *Rasa dhathu*, *Shukra dhathu* and *Ojas*. It is *Nirvapanam* (cooling), *Mrdukaram* (softening) and *Swaravarna prasaadanam* (clarity of voice and complexion). *Ghritha* is mainly advisable for those who are *Ksheena* and *Abala*. *Ghritha* is taken into account as *Uttama* among 4 varieties of *Sneha* by *Charaka*, because of its quality of effective assimilation with the properties of other drugs with which it is prepared with (*Samskaarasya Anuvarthanaath*). Among the various modalities of treatments of *Pandu Roga* laid down in Ayurvedic classics, use of *Ghritha Yogas* is initially mentioned, hinting towards the role of *Ghritha* in correcting the impaired metabolic functions and thereby improving absorption and further assimilation. Thus as a whole this recipe disintegrates *Dosha-dushya Samurchana* and helps to revive health.

1. *Loha bhasma* is attributed with quality of *Deepana*, *Ruchikara* and *Rakta vardhana*. It cures excess of *Pitta* with its *Sheeta virya* and *Kashaya-Tikta rasa*. It restores the functional activities of liver and spleen. By virtue of *Dravya samanyata* (*Samanya Vishesh Siddhant*), it increases Hemoglobin level in the blood.
2. *Abhyanga* improves blood circulation at local site, in conjunction with stimulating the neurons to give a tranquillizing and soothing result. It is performed in concentric fashion over the joints to enhance the lymphatic and venous emptying since large number of lymph nodes are situated within the joint spaces in conjunction with collateral blood vessels. In addition, *Abhyanga* enhances the local blood flow, transferring increased nutrients and oxygenated blood, that relieves exhaustion and muscle fatigue. Enhancement of blood flow conjointly assists the elimination of toxins and unwanted products from the tissue. Wholly, the outcome of *Abhyanga* is directly or indirectly associated with the stimulation of involuntary nervous system and central nervous system<sup>[13]</sup>.

3. *Kamadugha Rasa* contains *Swarasa* of *Dhatri*, *Ghratabharjita Gairika* which are having *Deepana*, *Pachana*, *Kaphavatahara*, *Pittashamana* and *Balya* properties, that cause *Agnideepti* and in turn leads to proper metabolism as well as formation of proper *Rasa raktadi Dhatus*. *Gairika* ( $Fe_2O_3$ ) consists of 70% of Iron. Attributing to its *Tiktarasa* and *Madhurarasa* it helps in *Agnideepana* and results in appropriate metabolism and *Dhatu Poshana* (anabolism). Thus, the cumulative effects of the drugs lead to correction of metabolism, iron absorption, improved blood formation and correction of disease.
4. *Dhatri Loha* contains *Shunti*, *Maricha* and *Pippali* which are *Deepana*, *Pachana*, *Kaphavatahara* and *Amadoshahara* as well as *Srotoshodhaka* properties that cause *Agnideepti* and *Amapachana* in turn leads to proper metabolism as well as formation of proper *rasa Raktadidhatus*. *Amalaki*, enhances the iron absorption. *Amalaki* (*Emblica officinalis*) is considered to be the richest source of Vitamin C that aids in absorption of iron. Vitamin C helps in reduction of ferric iron to ferrous iron that remains in soluble form even in neutral pH and is absorbed better. *Amalaki* increases the manufacturing of RBCs and increases immunity in the body. *Nisha* is *Pitta virechaka* and *Varnya*, thus corrects *Pitta* and *Rakta*. *Loha Bhasma*, has *Deepana*, *Balya*, *Rasayana* and *Raktavardhaka* properties that lead to proper metabolism and *Dhatuposhana*. Thus, the conjoint effect of the components of *Dhatri Loha*, results in enhanced metabolism, better iron absorption, increased production of RBCs and relief from the condition<sup>[14]</sup>.
5. Large number of ingredients in *Punarnava Mandoora* like, *Trikatu*, *Chitraka*, *Triphala*, *Vidanga* and *Pippalimula* are having the properties of improving appetite, promoting digestion and carminative properties. Some ingredients act as purgative which help in relieving constipation like *Trivrit*, *Haritaki* and *Danti* and assist in *Nitya Virechana* (removing the excess *Pitta* on a daily basis). Various *Acharyas* consider *Punarnava*, *Haridra*, *Pippali*, *Amalaki*, and *Trivrit* as *Vyadhipratyanika Dravyas* for *Pandu*. Several other ingredients like *Danti*, *Amalaki*, *Punarnava*, *Pippali*, *Kushtha* and *Daruharidra* are known to possess immunomodulating and antioxidant effects. Thereby they are likely to be beneficial in geriatric anemia as well<sup>[15]</sup>. Since *Punarnava mandura* is comprised of *Gomutra* (Cow's urine) it also acts as *Rasayana* by virtue of its antioxidant property. Its use is attributed for immunomodulation since ages. Erythropoietin hormone is found in Cow's urine which accounts for its extensive mentioning in the treatment of *Pandu* in *Samhitas*. Iron component in Cow's urine helps to maintain a balance and further production of RBCs and Haemoglobin<sup>16</sup>.
6. *Arogyavardhini vati* comprises *Parada*, *Gandhaka*, *Abhraka*, *Loha*, *Tamra* etc along with large amount of *Katuki*, which is extensively used herb in disorders of liver. It contains *Haritaki* (*Terminalia chebula*) which has *Kashayarasa* (astringent) and does *Rechana* (laxative in nature). *Bibhitaki* (*Terminalia belerica*) is a laxative as well. It is used in digestive disorders and is a time tested anthelmintic. *Amalaki*- (*Emblica officinalis*) has high concentration of antioxidants, and is hepato protective with immuno modulator qualities. *Shuddh shilajit* is effective for revival of exuberance. Its action is similar to that of nectar; having antioxidant properties and thereby prolongs the aging process. *Guggulu* (*Commiphora mukul*), is useful in bringing down cholesterol by transforming it into bile. It is beneficial for elimination of unwanted fats and stabilizing the cholesterol levels. *Chitraka* (*Plumbago zeylancia*) is useful in conditions of indigestion, loss of appetite, piles, colitis, worms and several liver disorders. *Arogyavardhini vati* has *Rakta-pitta shodhaka*, *yakrut-uttejaka* property. It does the *Shoshan* (assimilation) of excess *Snigdha dravyas* (unctuous substances) present in the body and does the *Raktavardhana* (improves quality of blood). Thus, the contents of *Arogyavardhani Vati* like *Triphala* and *Katuki* (*Picrorhiza kurroia*), with *Bhasma* (metallic/mineral preparation) and *Kajjali* (mercury sulphur bond) becomes capable for detoxifying due to *Sara Guna* by removing obstruction in *Srotas* (channels). Based on this fact the drug helps in breaking the pathogenesis of *Pandu Roga* (Anaemia). *Yakrit* being the *Moola* for *Raktavaha srotas*, when gets stimulated, might help in promoting improved quality and quantity of *Rakta Dhatu*.
7. Effectiveness of *Haritaki*, *Mandoora Bhasma*, and *Loha Bhasma* to increase blood hemoglobin level has been proved scientifically by previous research studies<sup>[17,18,19]</sup>.
8. *Blud Syrup* contains *Seva* (*Pyrus malus*), *Punarnava* (*Boerrhavia diffusa*), *Ashwagandha* (*Withania somnifera*), and *Yashtimadhu* (*Glycyrrhiza glabra*) as main active ingredients along with *Amalaki* (*Emblica officinalis*), *Vibhitaki* (*Terminalia belerica*) and *Shuddha Kaseesa*. *Kaseesa* is indicated in *Pandu*, *Agnimandya*, *Kashtartava*, *Shotha*, *Gudabhramsha*, *Rajorodha*, *Arsha*, *Yonivyapada* and *Shvitrakustha*. *Kasisa bhasma* has definite haematonic effect and it leads to cytological and chromological changes in the blood<sup>[20]</sup>.

## Discussion on Haematological Parameters

- 1. Total RBC Count:** Bone marrow produces about half a litre of blood every week in a normal healthy adult. On being stimulated to peak activity along with adequate nutrition, the marrow can recoup for the loss of several pints of blood per week. The marrow is capable of increasing its RBC production up to eight times the usual rate<sup>[21]</sup>. Hence, it can be seen that the amount of RBCs have increased gradually by the correction of absorption and improved nutritional supplementation in the form of oral medicines as well *Dadimadya Ghrita Matra Basti*.
- 2. Haemoglobin levels:** Hemoglobin (Hb) is the most abundant protein in erythrocytes, whose function is to transport oxygen from the lungs to tissues. 1gm% hemoglobin, when fully saturated, combines with 1.34mL of oxygen, therefore, hemoglobin concentration is an index of oxygen carrying capacity of blood. Anemia may result from any condition that leads to depletion of concentration of functional haemoglobin or in destruction of RBCs. With effective supplementation, it can be observed that there is improved erythropoiesis and proper maturation of RBC resulting in increase of Haemoglobin levels.
- 3. Haematocrit:** The hematocrit measures the volume of red blood cells compared to the total blood volume (red blood cells and plasma). The average haematocrit value in men is 40 to 54%; and in women it is 36 to 48%. Lower than normal haematocrit values can be a result of anemia, nutritional deficiencies, blood loss or active infection in the body. It can be observed that there is eventual increase of haematocrit values suggesting that there is increase in the number of red blood cells.
- 4. MCV:** When the MCV is below the reference interval it is called microcytosis; within the reference interval, normocytosis; and above the reference interval, macrocytosis. The initial blood picture depicted macrocytosis indicative of nutritional deficiency anemia while gradually it was observed that the MCV values came down to normal range, suggesting the correction of Macrocytosis, indirectly implicating that the deficiency has been overcome, through correction of *Agni*, leading to appropriate absorption as well by supplementation through various formulations like *Dhatri Loha*, *Dadimadya Ghrita* etc.
- 5. MCHC:** Hypochromia is a condition where MCHC levels are below the normal reference interval while it is considered as Normochromia if the MCHC value lies within the reference interval. Hemoglobin production is regulated by the accumulation of hemoglobin to a concentration of approximately

33%, at which point it remains soluble and with optimum function. MCHC can be raised in conditions of dehydration and in macrocytic anemia. It can be seen that there is gradual reduction of MCHC to normal ranges in the later reports, suggesting the correction of macrocytes thereby indicating appropriate maturation of RBC.

- 6. MCH:** MCH stands for mean corpuscular hemoglobin. It refers to the average amount of hemoglobin present in a single RBC. The reference range for MCH lies between 27.5 and 33.2 picograms (pg). An MCH value above 33.2 pg is regarded as high MCH. High MCH value can often be caused by anemia due to nutritional deficiency particularly of Vitamins and Folate. There is gradual decrease of MCH values to normal range during the course of treatment, pointing towards correction of nutritional deficiency in the patient.
- 7. RDW:** It is a statistical calculation of the variability of the size of the red blood cells. An increase in RDW suggests increased variation in size of red cell termed as anisocytosis. An RDW value which lies within the reference interval suggests no anisocytosis. A sudden raise in RDW can be observed after the administration of *Matra Basti*, indicating the probable increase in production of red blood cells leading to a wide difference in the morphology as a large number of cells could be in the reticulocyte stage, undergoing maturation, after which there is constant increase in haemoglobin levels in the next two visits, and RDW range has come down to normal levels.

## CONCLUSION

Clinical features of *Vataja Pandu roga* (Nutritional Deficiency Anemia) are mainly due to quantitative and qualitative reduction of Hemoglobin and less oxygen supply in the tissues. With the aid of Ayurvedic interventions, when there is increase in haemoglobin levels, body tissues get adequate oxygen, body metabolism improves, and ultimately relief in clinical symptoms is observed. By apt diagnosis and correction of root cause of the disease, it can be clearly seen that there has been significant improvement in subjective parameters as well as haematological components. The present case study signifies the role of Ayurvedic multimodal treatment approach in successfully overcoming the condition without any evident side effects. Hence it can be concluded that principle of treatment explained in Ayurveda can be used to effectively treat Nutritional Deficiency Anemia. Since this is a single case study, further study is needed to observe the effect of above treatment modalities on more number of patients and for longer duration to remark other benefits.

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