HARIDRA (CURCUMA LONGA LINN.) – A MIRACULOUS DRUG FOR ANEMIA

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ABSTRACT

Panduroga can be correlated with Anemia on the ground of its similar signs and symptoms. Panduroga (Anemia) is well described in Ayurveda since ancient time including etiology, pathogenesis, clinical features, prognosis, complications and management. Haridra (Curcuma longa Linn.) of the family Zingiberaceae is commonly used drug. Haridra (Curcuma longa Linn.) is used as anti-inflammatory, cholagogue, hepatoprotective, blood-purifier, antioxidant, detoxifier and regenerator of liver tissue, antiasthmatic, antiprotozoal, stomachic, carminative etc. Here attempt was made to highlight role of drug Haridra (Curcuma Longa Linn.) in the management of Anemia (Pandu) as per ayurvedic as well as modern perspective. The data in the present review have been organized in various sections according to Ayurvedic view and with recent researches carried out on the drug.

KEY WORDS: Anemia, Curcuma longa, Haridra, Pandu.

INTRODUCTION

“Pandu Roga” can be correlated with Anemia on the ground of its similar signs and symptoms. The meaning of word Pandu is pallor of the body\cite{1} or resembling the colour of pollen of Ketaki flower along with yellow colour.\cite{2} Pandu has been well described in Ayurveda since ancient times including etiology, pathogenesis, clinical features, prognosis, complications and management. Anemia is defined as a haemoglobin concentration in blood below the lower limit of the normal range for the age and sex of individual leads to deficiency in the number of red blood cells or in the haemoglobin content of the blood, resulting in pallor, shortness of breath and lack of energy.\cite{3} According to Ayurveda it is not
restricted upto blood and blood forming haemopoietic system, but it is caused due to non-sequential transformation of food into proper body components *Rasa* (plasma), *Rakta* (blood) up to *Shukra* (semen) & *Oja* (the essence of the seven *Dhatus* or bodily tissues). That’s why *Acharya Charaka*\textsuperscript{[4]} has mentioned *Panduroga* as a disease of ‘*Rasavaha Strota’*. *Panduroga* is developed as a result of imbalance and variation of *Tridoshas* (*Vata*, *Pitta*, *Kapha*) due to either *Santarpanjanya* (over nutrition) or *Apatarpanjanya* (under nutrition) causes.

*Panduroga* can be overcome through the various traditional systems such as *Ayurveda*. There are various herbal and herbo mineral formulations mentioned in Ayurvedic classics for the management of *Pandu*. From the time of Atharvaveda, *Haridra* is being used as a medicine for mankind. Turmeric (*Curcuma longa*) has been used for centuries in Ayurvedic medicine, which amalgamate the medicinal goods of herbs with food. This astonishing herb has established its way into the attention in the west because of its wide range of medicinal benefits.\textsuperscript{[5]}

Current research has focused on turmeric’s antioxidant, hepatoprotective, anti-inflammatory, anticarcinogenic, and antimicrobial properties, including hypoglycemic property. However, reports on its antianemic properties are limited and therefore this review study seeks the effect of *C. longa* on Anemia. This article focuses on one the antianemic activity of turmeric with use of ancients and contemporary knowledge.

**UNDERSTANDING OF PANDUROGA**
Clinical features of *Pandu* develop from the depletion of *Rasa Dhatu* which in turn becomes ineffective in the production of *Rakta Dhatu*. The decreased level of circulating *Rasa* and *Rakta Dhatu*, which have the prime functions of nourishment and providing support to the vital functions, gives rise to the symptoms like depletion of blood and flesh, fatigue, body ache, palpitation, periorbital Oedema, anorexia, dyspepsia, fever, dyspnoea and fainting.\textsuperscript{[6]}

**MATERIAL AND METHODS**
The data were collected from *Ayurvedic* as well as contemporary literatures and scientific journals, books etc.

**HARIDRA (CURCUMA LONGA LINN)**
Turmeric (*Haridra*) is an auspicious beauty spot, daily applied on the forehead by Hindu females. Application of turmeric paste to the bride is an essential procedure of Hindu
rituals.\textsuperscript{[7]} Haridra (Curcuma longa Linn.) of the family Zingiberaceae has esteemed medicinal properties referred in Ayurveda and has been widely used in India since ancient times in Ayurveda, turmeric has been well documented for its therapeutic potentials. The great sage Acharya Charaka has categorized it in various Dashemani (group of ten drugs) such as Lekhaniya\textsuperscript{[8]} (scraping herbs), Vishaghna\textsuperscript{[9]} (anti-toxin) and Kustaghna\textsuperscript{[9]} (anti-dermatosis). Acharya Sushruta has classified Haridra under Haridradi Gana\textsuperscript{[10]}, Tiktaskanda\textsuperscript{[11]} (group of bitter drugs), Mustadi Gana\textsuperscript{[12]}, Lakshadi Gana\textsuperscript{[13]} Vataprashamana Gana (vata alleviating group)\textsuperscript{[14]} and Shleshmaprashamana Gana (kapha alleviating group).\textsuperscript{[15]} Turmeric has been used traditionally for almost every human ailment and many of these historic uses have been scientifically validated with application in modern times.

SYNONYMS OF HARIDRA IN Sanskrit\textsuperscript{[16]}

Rajani, Nisha, Gauri, Krimighna, Vishaghni, Yoshitpriya, Kanchani, Varavarnini, Hattavisinisi, Aneshta, Dirgharaga, Hemaragi, Harita, Pitika, Ratrinamika, Shobha, Suvarna, Shyama, Vara, Varangi, Varnadatri, Varnini, Yuvati, Gandhapalashika, Mangalaprada, Mangalya, Pavitra, Tapasvini, Uma, Mehaghni, Jayanti

Botanical name: Curcuma longa Linn. (C. domestica Valeton.)

Family: Zingiberaceae.

Regional Names\textsuperscript{[17]}

English: Turmeric
Assam: Haldhi, Haladhi
Bengali: Halud, Haldi
Gujarati : Haldar
Hindi: Haldi, Hardi
Kannad: Arishina
Malayam: Manjala
Marathi: Halad
Punjabi: Hardakh
Tamil: Manjal
Telugu: Pasupu
Urdu: Haldi.
**Habitat:** Cultivated all over India, particularly in West Bengal, Tamil Nadu and Maharashtra.

**Geographical Source**
*Haridra* consists of the dried rhizomes of *Curcuma longa* Linn. (Fam. Zingiberaceae), a perennial herb grows to a height of three to five feet extensively cultivated in all parts of the country, crop is harvested after 9-10 months when lower leaves turn yellow rhizomes carefully dug up with hand-picks between October-April and boiled, cleaned and dried, yielding a yellow powder.

**Description of the drug:** The plant is perennial herb with short stem and tufted leaves. Primary tubers are ellipsoidal and bear many rhizomes showing pattern of monopodial growth. The leaves are acuminate, ascending and pubescent beneath, consists of cone shaped collection of numerous ovate bracts and about 10-18 cm long and 5 cm broad. The flowers are pale yellow borne in pairs in the axils. The seeds are black and shining with large, lacerate and white aril. Flowering and fruiting take place in winter.

Rhizomes are ovate, oblong or pyriform (round turmeric) or cylindrical, often short branched (long turmeric), former about half as broad as long, latter 2-5 cm long and about 1-1.8 cm thick, externally yellowish to yellowish-brown with root scars and annulations of leaf bases, fracture horny, fractured surface orange to reddish brown, central cylinder twice as broad as cortex: odour and taste characteristic.

**Chemical Constituents**
Turmeric is an excellent source of both iron and manganese. It is also a good source of vitamin B6, dietary fiber, and potassium. The primary active constituent of turmeric and the one responsible for its vibrant yellow color is curcumin. Curcumin is the most well studied constituent. The main constituents groups are polyphenolic curcuminoids which include: curcumin (diferuloylmethan), demethoxycurcumin, bisdemethoxycurcumin, and cyclocurcumin. Turmeric also contains: sesquiterpenes (turmerone, atlantone, zingiberone, turmeronol, germancrone, and bisabolene), carbohydrates, protein, resins and caffeic acid.

**Parts Used:** The rhizome, leaves and flowers are used medicinal purpose.
Common adulteration\textsuperscript{[20]}

Turmeric powder is sometimes adulterated with yellow earth, rice or maize starch, sand, grit and talc while the whole turmeric is policed with lead chromate or metanil yellow.

Dose\textsuperscript{[25]} 1-3 gm of the drug in powder form

**Properties:** Screening the various classical texts, *Rasa* (taste), *Virya* (potency), *Vipaka* (post digestion effect) and *Guna* (property) of Haridra are mentioned in the table 1.

**Table 1: Properties of Haridra (Curcuma Longa Linn.)**

<table>
<thead>
<tr>
<th>Text</th>
<th>Rasa (Taste)</th>
<th>Guna (property)</th>
<th>Virya (potency)</th>
<th>Vipaka (post digestion effect)</th>
<th>Doshagnata (pacification of Dosha)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Katu (pungent)</td>
<td>Tikta (bitter)</td>
<td>Ruksha (dry)</td>
<td>Ushna (hot)</td>
<td></td>
</tr>
<tr>
<td>A.S. \textsuperscript{[26]}</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>-</td>
<td>KP</td>
</tr>
<tr>
<td>B.P. \textsuperscript{[27]}</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>KP</td>
</tr>
<tr>
<td>D.N. \textsuperscript{[28]}</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>R.N. \textsuperscript{[29]}</td>
<td>+</td>
<td>+</td>
<td>-</td>
<td>+</td>
<td>K</td>
</tr>
<tr>
<td>K.N. \textsuperscript{[30]}</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>KP</td>
</tr>
</tbody>
</table>


**Medicinal applications:**\textsuperscript{[31]} Anemia, atherosclerosis, diabetes, oedema, haemorrhoids, hepatitis, hysteria, indigestion, inflammation, skin disease, urinary disease, wound and bruise healing, psoriasis, anorexia, cough, liver disorders, rheumatism, sinusitis.

**Various formulations of Haridra in the Management of Panduroga**

**Table 2: Formulations of Haridra**

<table>
<thead>
<tr>
<th>Sr. no.</th>
<th>Name of formulation</th>
<th>Ingredients</th>
<th>Reference</th>
<th>Anupana (Vehicle)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Few <em>Churna</em> (Powder) preparation of Haridra</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Ajasakrutadi churna</td>
<td>Aja Sakruta, Bid lavana, <em>Haridra</em>, Saindhava</td>
<td>S.S.U. 44/25;292</td>
<td>Honey</td>
</tr>
<tr>
<td>2</td>
<td>Haridra, Triphala Yoga</td>
<td>Triphala, <em>Haridra</em></td>
<td>S.S. U. 44/19; 291</td>
<td>Ghee, Honey</td>
</tr>
<tr>
<td>Few <em>Kshara</em> (alkali) preparation of Haridra</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.</td>
<td>Ksharamruta</td>
<td>Kshara of Musta, Palasha, Arjuna, Dhava, Apamarga, Dhatura, <em>Haridra</em>, Vasa, Tila</td>
<td>H.S. 3\textsuperscript{rd} Sthana, 4/16-17; 230</td>
<td>Not mentioned</td>
</tr>
<tr>
<td>Few <em>Ghrita–Taila</em> (Medicated Ghee and Oil) preparation of Haridra</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Bruhtayadi Ghrita</td>
<td>Bruhati, Kantakari, <em>Haridra</em></td>
<td>S.S. U. 44/22 p. 291</td>
<td>Kshira (Milk)</td>
</tr>
<tr>
<td>#</td>
<td>Preparation</td>
<td>Ingredients</td>
<td>Reference</td>
<td>Not mentioned</td>
</tr>
<tr>
<td>----</td>
<td>------------------------------</td>
<td>----------------------------------------------------------------------------</td>
<td>-----------------------------------------------</td>
<td>---------------</td>
</tr>
<tr>
<td>3</td>
<td>Bruhat Panchagavya Ghrita</td>
<td>Dwi Panchamula, Triphala, Haridra, Daruharidra, Vacha, Saptaparna, Nilini, Katurohini, Trivrita, Chitraka</td>
<td>C.K. 21/17-22; 180</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Katukadhya Ghrita</td>
<td>Katuki, Rohini, Musta, Haridra, Daruharidra, Vatsaka, Patola, Chandana, Nimba, Bhunimba Devdaru</td>
<td>C.S.Chi. 16/47-49; 95-95, (Vol. IV)</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Mahabhallataka Guda</td>
<td>Nimba, Bhallataka, Shariva, Katuki, Triphala, Trikatu, Haridra, Vacha, Khadira, Patola, Vatsaka, Vidanga, Vasa, bhunimba,</td>
<td>B.R. 54/207-221</td>
<td>Kshira (Milk)</td>
</tr>
<tr>
<td>6</td>
<td>Murvadya Ghrita</td>
<td>Murva, Katuki, Haridra, Vasa, Pippali, Chandana, Parpata, Patola, Trayamana, Bhunimba, Kshira, Ghee</td>
<td>B.R. 12/136-137; 276</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Tiktaka Ghrita</td>
<td>Triphala, Haridra, Daruharidra, vasa, Parpata, Patola, Katuki, Nimba, Pippali, Chandana, Indrayava</td>
<td>B.R. 54/239-242; 633</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Vyoshadhya Ghrita (Mrudbhakhanaja Pandu)</td>
<td>Trikatu, Bilva, Haridra, Musta, Daruharidra, Triphala, Patha, Punarnava, DevdarauLauha Bhasma</td>
<td>C.S.Chi. 16/119-20; 111 (Vol IV)</td>
<td></td>
</tr>
</tbody>
</table>

Few Leha (linctus) preparation of Haridra

<table>
<thead>
<tr>
<th>#</th>
<th>Preparation</th>
<th>Ingredients</th>
<th>Reference</th>
<th>Not mentioned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Rajanyadi Leha</td>
<td>Haridra, Daruharidra, Bruhati, Shaliparni, prishniparni, Shatahva</td>
<td>C.K.64/22, Balaroga; 523</td>
<td>Honey, Ghee</td>
</tr>
<tr>
<td>2</td>
<td>Khadiravaleha</td>
<td>Khadira Kwatha, Vidanga, Dhanyaka, Bala, Katuki, Sita, yashthimadhhu, Triphala, Haridra, Daruharidra</td>
<td>Bangasena 44/127-128; 548</td>
<td>Honey, Ghee</td>
</tr>
</tbody>
</table>

Few Guggulu /Modaka/ Vati (Pills) preparation of Haridra

<table>
<thead>
<tr>
<th>#</th>
<th>Preparation</th>
<th>Ingredients</th>
<th>Reference</th>
<th>Not mentioned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Punarnava Mandura</td>
<td>Punarnava, Trivrita, Trikatu, Vidanga, Daruharidra, Chitraka, Kushtha, Haridra, Daruharidra, Danti, Chavya, Musta, Pippali, Pippalimula, Suddha madura, Gomutra</td>
<td>C.S.Chi. 16/93-96; 105,06</td>
<td>Takra (Buttermilk)</td>
</tr>
<tr>
<td>2</td>
<td>Trikutadi Vati</td>
<td>Trikuta (Trikatu), Triphala, Haridra, Nilini fruit, Musta, manjistha, Katurohini,</td>
<td>Bangasena, 42/54-57; 542</td>
<td>Tandulambu (rice water)</td>
</tr>
<tr>
<td>No.</td>
<td>Preparation Name</td>
<td>Ingredients</td>
<td>Reference/Details</td>
<td>Notation</td>
</tr>
<tr>
<td>-----</td>
<td>----------------------------------</td>
<td>-----------------------------------------------------------------------------</td>
<td>----------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>3</td>
<td>Chandraprabha Gutika</td>
<td>Shatavari, Shigrubija, Gajapippali, Shaliparni, Bhallatakta, Danti</td>
<td>B.R. 37/102-110; 514</td>
<td>Not mentioned</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Karpura, Vacha, Musta, <strong>Haridra</strong>, Ativisha, Trivrita Danti, Twaka, Ela, Chitraka, Guggulu, Shilajatu</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Few Asava- Arishta (fermented liquor) preparation of Haridra**

1. **Gaudarishta**
   - Manjistha, **Haridra**, Draksha, Balamula, Lauha
   - Reference: C.S. Chi. 16/105; 108 (Vol. IV)
   - Not mentioned

2. **Moolasava**
   - **Haridra**, Dashamula, Shatavari, Rushabhaka, Jivaka, Musta, Manjistha, Vidanga, Madhuka, Lodhra
   - Reference: C.S. Chi. 15/156-159
   - Not mentioned

3. **Pippalyasava**
   - Pippali, Maricha, Chavya, **Haridra**, Chitraka, Vidanga, Lodhra, Patha, Dhati, Ushira, Chandana, Lavanga, Ela, Twaka, Jatamansi
   - Reference: Shas.S., Madhyama Khandha 10/28-33
   - Not mentioned

4. **Kumaryasava**
   - Kumari, Lavanga, Chaturjata, Chitraka, **Haridra**, Daruwaridra, Pippalimula, Vidanga, Gajapippali, Chavika, Kramuka, Katurohini, Musta, Triphala, Danti, kapikachhhu
   - Reference: Sha.S. Madhyama Khandha 10/19-27; 236
   - Not mentioned

5. **Dashamularishta**
   - Dashamula, Chitraka, Pushkaramula, Guduchi, Lodhra, Dhati, Manjistha, Devdaru, Pathya, Vidanga, Jatamansi, **Haridra**, Nagkeshara, Musta, Indrayava
   - Reference: Sha.S. Madhyama Khandha 10/78-92; 239
   - Not mentioned

**Kharaliya Rasayoga (Herbomineral preparation) of Haridra**

1. **Nisha Lauha**
   - Lauha churna, **Haridra**, Triphala, daruwaridra, Katuki
   - Reference: B. R. 12/29; 270
   - Honey, Ghee

2. **Dhatri Lauha**
   - Amalaki, **Haridra**, Trikatu, Siddhau Lauha
   - Reference: B.R. 12/30, 270
   - Honey, Ghee

3. **Panchamrita Lauha Mandura**
   - Lauha, Tamra Bhasma, Kajjali, Trikatu, Triphala, Musta, Vidanga, Chitraka, **Haridra**, Daruwaridra, Shati, Chavya, Yamani, Jirakadwaya
   - Reference: B. R. 12/52-58; 271
   - Honey

4. **Pandupanchanana Rasa**
   - Lauha, Tamra Bhasma, Danti, Chavika, Trivrita, Kutaja, Katuki, **Haridra**, Sudha Mandura
   - Reference: B.R. 12/99-102; 274
   - Ushna Jala (hot water)

5. **Punarnava Mandura**
   - Punarnava, Trivrita, Trikatu, Vidanga, **Haridra**, Musta, Pippali, Madura, Gomutra
   - Reference: C.S. Chi. 16/93-96; 105-106
   - Takra (buttermilk)
C.S.\textsuperscript{[4]} - Charaka Samhita, S.S.\textsuperscript{[10]} - Sushruta Samhita, B.R.\textsuperscript{[32]} - Bhaishajya Ratnavali, K.S.\textsuperscript{[33]} - Kashyap Samhita, H.S.\textsuperscript{[34]} - Harita Samhita, C. K.\textsuperscript{[35]} - Chakradatta, Sha.S.\textsuperscript{[36]} - Sharngadhara Samhita, Chi.- Chikitsa sthana, U.- Uttaratantra

**PROBABLE MODE OF ACTION OF TURMERIC (CURCUMA LONGA) IN PANDUROGA**

*Katu Rasa* (pungent) can promote *Agni* (digestive and metabolic fire) by their *Dipana* (appetizer), & *Pachana* (digestive) properties which can nullify the *Agnimandhya* (weakened digestive fire), *Aruchi* (anorexia) like symptoms of *Pandu roga*. Further, *Katu Rasa* has been said as *margan vivrunoti* \textsuperscript{[37]} (penetrates obstruction in channels) and reach even minutes level and increase micro circulation of the *Rasa* all over the body. By virtue of *Dipana*, *Pachana* property it increases the *Jatharagni* (digestive and metabolic fire) and *Dhatvagni* (tissue metabolism) and thus may helpful to break the pathogenesis of *Panduroga*. *Ruksha* (dry) property of *Haridra* can revert back the conditions like *Dhatu Shaithilya* (flabbiness in tissues) found in *Panduroga*.

Owing to its hepatoprotective effect,\textsuperscript{[38]} maintains normal function of *Yakrita* (Liver) to convert *Rasa* into *Rakta* and thus produce excellent quality of *Rakta Dhatu* (blood). By virtue of Appetizer, Digestive, Hepatoprotective, Cholagogue activity of *Haridra*, it improves digestion and metabolism, ultimately absorption of nutrition. As *curcuma longa* is proved as antioxidant,\textsuperscript{[39]} it has been found to be a very good immune enhancer. It improves general health, immunity, vigor and luster of the skin etc. in patients having anemia. Moreover, Iron deficiency anemia can be overcome through turmeric rich in iron which are essential components in the formation of red blood cells.\textsuperscript{[40]}

**Role of Liver dysfunction in the development of Anemia**

Liver performs vital roles in maintaining homeostasis and health. Liver is the major storage site for iron, Vit B12 and folic acid. The liver is involved in or is responsible for various hematological abnormalities due to its unique portal circulation and its synthetic (clotting factors, thrombopoietin) and immune functions. Primary liver problems like cirrhosis can lead to hematological abnormalities and primary hematological diseases can in turn affect the liver and its functioning. Abnormalities in hematological indices are frequently encountered in cirrhosis.\textsuperscript{[41]} Moreover, The liver plays an important role in the digestion and processing of food. A person with a damaged liver may have impaired bile production and flow. When this happens, the body may not be able to properly absorb nutrients. The frequent association of
anemia with chronic liver disease and/or hepatocellular failure provides a rationale for examining the role of the liver in the formation and destruction of red blood cells. Indeed, a variety of different mechanisms may be implicated in the development of anemia in patients with liver disease.\[42]\n
In Ayurvedic texts Yakrita (Liver) has given more importance in connection with metabolic functions. Yakrita (Liver) is said to be the seat of Pitta. All the functions of Pitta, especially Ranjaka Pitta are attributed to liver. Again liver and spleen are considered as, the root of Raktavahasrotas. So, liver is very much important in all diseases concerned with Raktavaha Srotas.

Alcohol and Anemia\[42]\n
Drinking of alcohol is said to be one of the cause of Panduroga by Acharya Sushruta. Alcohol is toxic to the liver. Drinking alcohol in excess can give rise to acute alcoholic hepatitis, fatty liver, alcoholic intoxication and cirrhosis of the liver. It is difficult to overcome addiction to alcohol as in several cases. Alcohol is implicated in the pathogenesis of chronic liver disease; it may contribute to anemia secondary to its direct effects on the liver and also to other diverse mechanisms. Folic acid and vitamin B12 deficiencies develop frequently in patients with cirrhosis. These deficiencies may be related to inadequate food intake or intestinal malabsorption. Anemia in an alcoholic may also arise as a consequence of the direct toxic effects of alcohol on erythrocyte precursors in the bone marrow.

Hepatoprotective activity of Curcuma Longa Linn.

Curcumin, the most common antioxidant constituent of Curcuma longa rhizome extract, was reported to enhance apoptosis of damaged hepatocytes which might be the protective mechanism whereby curcumin down-regulated inflammatory effects and fibrogenesis of the liver. The ethanolic extract of Curcuma Longa rhizomes showed a significant hepatoprotective effect when orally administrated in doses of 250 mg/kg and 500 mg/kg, and the protective effect was dose dependent.\[43]\n
Thus, by counter acting the liver pathology, anemia is corrected by curcuma longa.

Role of Inflammation in the development of Anemia and Anti-inflammatory activity of Curcuma Longa

Anemia of inflammation (AI) has historically been termed the “anemia of chronic disease” and is most commonly observed in association with infection, rheumatologic disorders,
malignancy, and other chronic illnesses. It seems more likely that the oxidative stress that accompanies the evolution of our life is the real cause of the chronic inflammatory conditions and that the same oxidative stress is actually a major cause of this anemia. The results of preclinical and clinical studies, researchers have suggested the following main mechanisms by which inflammation may affect anemia. Just as important seems to be the direct role of inflammatory mediators in interfering with erythropoiesis by suppressing the bone marrow. In fact, patients with chronic inflammatory diseases have been demonstrated to have decreased red cell survival, disorders of erythropoiesis, EPO levels low for the degree of anemia.\textsuperscript{[44]}

Curcumin is the phytochemical derived from the rhizome of Curcuma longa. Curcuma longa (turmeric) has a long history of use in Ayurvedic medicine as a treatment for inflammatory conditions.\textsuperscript{[45]} The role of curcumin is supported by a number of scientific papers that have confirmed its anti-inflammatory actions both in vitro and in vivo.\textsuperscript{[23],[46],[47]}

Data of Clinical studies done on Haridra in Panduroga

1. Study Design: Kumawat N et al\textsuperscript{[48]} studied and given Nisha lauha (Haritaki, Amalaki, Bibhitaki, Haridra, Kutki, Daruharidra in equal ratio and Lauha Bhasma in six ratio) in a dose 500 mg twice daily and Phalatrikadi kwath (Haritaki, Amalaki, Bhibhitaki, Kutki, Gudichi, Vasa, Nimbha, Bhunimba) in a dose 40 ml twice daily orally before taking meal with Anupana (vehicle) of Madhu. Ferrous Sulphate was given in a dose of 200 mg thrice a day orally after taking meal with water. Duration of trial was for 60 days.

Result: Highly significant improvement was observed in hemoglobin level after sixty days treatment in both groups A and B. The intergroup comparison showed equal results in both the groups which are statistically insignificant. In case of ESR, PCV, MCH, MCHC, TRBC, Siron, TIBC in both groups statistically highly significant results observed in both the groups (<0.001).

2. Study Design: In this study\textsuperscript{[49]} Virechana (with Trivrita powder) was given followed by Shamana treatment Tab. Nisha Loha (250mg) twice a day with Anupana of Honey for 45 days in group A. While in group B Tab. Nisha Loha was given without doing Virechana.

Result: Study done by James Chacko showed 48% of moderate improvement, 32% patients were assessed under improvement by Shamana group i.e. Nisha Loha. Only 12% showed marked improvement. 8% were under unchanged category, whereas nobody included under
complete relief. Moreover, *Nisha Loha* provided highly significant relief (p<0.001) in the management of *Panduta* and *Arohana ayasa* by 48% and 44% respectively. Study revealed that Hb% was significantly increased by 48% by *Nisha Lauha*.

3. **Study Design:**[60] 30 children having IDA were given *Dhatri Loha* compound (*Amalaki, Lohabhasma, Haridra, Trikatu, Amalakikashaya* as per need for bhavana (lavage)) (250 mg) twice a day for period of 2 months.

**Result:** Study done by Ragamala KC et al revealed that *Dhatri Lauha* provided statistically highly significant change (P = <0.001) resulted in the signs and symptoms of IDA. There was a statistically highly significant response in hemoglobin concentration in the group (P =<0.001).

**CONCLUSION**

It can be concluded that the *Haridra* (Turmeric) has a lot of potentials in the treatment of Anemia owing to its multiple pharmacological activities such as haematinic, digestive, appetizer, antioxidant, Hepatoprotective, anti-inflammatory.

Experimental data suggests that curcumin acts as antioxidant and hepatoprotective which may beneficial in treating patients of anemia with compromised liver and decreased immunity. Various clinical research works have also proved the role of *Haridra in Pandu* (anemia). Thus, it can be concluded that, *Haridra* may play an important role in the treatment of Anemia.

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