



VATAJA PANDU – A PARALLEL PERSPECTIVE

Ramyashree A S¹, Prashanth Jain² and Geetha B. Markande³

¹Final year PG Scholar (Dept. of Roganidana Evum Vikriti Vigyan), Alva's Ayurveda Medical College and Hospital, Moodubidire, Karnataka, India.

²Professor and HOD (Dept. of P.G Studies in Roganidana Evum Vikriti Vigyan), Alva's Ayurveda Medical College and Hospital, Moodubidire, Karnataka, India.

³Professor (Dept. of Roganidana Evum Vikriti Vigyan), Alva's Ayurveda Medical College and Hospital, Moodubidire, Karnataka, India.

ABSTRACT

Pandu roga is a *Varnopalakshitha vyadhi* characterised by the changes in the skin colour to *Shweta* (white), *peeta* (yellow), *Harita* (Greenish) etc. The clinical condition of *Pandu* in Ayurveda can be co-related with Anaemia described in Modern Medical Science, due to the resemblance in the clinical signs and symptoms. Anaemia is a major Global Public health problem and the most prevalent Nutritional deficiency disorder in the world. The *Pandu roga* involves lack of haemoglobin due to poor intake of iron and other nutrients through dietary sources, poor absorption and digestive problems may also leads Anaemia. The cardinal sign of anaemia is paleness of skin which is described as *twak- pandutha* in case of *Pandu* in Ayurveda. Here, in this article an attempt is made to understand the concept of *Vataja Pandu* in Contemporary science.

KEYWORDS: *Pandu*, Nutritional deficiency, Anaemia.

INTRODUCTION-

Pandu is *Pitta pradhana* and mainly *Rasa pradoshaja vyadhi* and is the most common presentation in the clinical practice. *Pandutva* has been mentioned as cardinal symptoms of the disease which is related with the colour and complexion of the body. *Pandu* is usually being correlated with anaemia, as majority of features are similar like reduction in the constituents of blood is inevitable in both. *Pandu roga* is related with both important *dhathu Rasa* and *Rakta*, principal function of both these *dhathu* has been described as *Preenana* and *Jeevana karma*. This is how disease *Pandu* can be the choice of disease to access the *Dhathuposhana krama*.

A major characteristic of *Pandu Roga* diagnosis is pallor on the skin, which is produced by a quantitative and qualitative storage of *Raktha Dhatu*, either in the form of RBC's or haemoglobin¹.

There is a great amount of resemblance in the features of *Pandu roga* and Anaemia. The various *Pandu roga* subtypes as described in Ayurveda have been correlated to a particular type of Anaemia². The commonest type of Anaemia observed is Iron deficiency anaemia, Anaemia can result from a large number of causes, including Nutritional deficiencies, acute or slow loss of blood due to Trauma or diseases, destruction of RBCs due to various metabolic and immunological abnormalities or toxins, disease of bone marrow, general systemic diseases like infections and malignancies³.

Low and lower- middle income countries bear the greatest burden of Anaemia, particularly affecting populations living in rural settings, in poorer households and who have received no formal education. Globally, it is estimated that 40% of all children aged 6-59 months, 37% of pregnant women and 30% of women 15-49 years of age are affected by anaemia⁴.

NIRUKTHI –

पडि नाशने धातु + कु प्रत्यय

- The word “*Pandu*” is derived from root “*Padi-Nashane*” by adding “*ku*” prathyaya in it⁵.
- The meaning of which is always taken in sense of “*nashana*” i.e loss.
- *Pandu* is a disease in which there is *vaivarnya* or change in the normal color of the body.

PARIBHASHA-

According to *Shabdarnava kosha* ‘*Pandustu Peetabhagardha Ketaki Dhulisannibham*’ means *Pandu* is like the colour of pollen grains of *ketaki* flower which is whitish yellow in colour.

Synonyms-

According to *Sushruta Kamala*, *panaki*, *Laghrak*, *Alas* and *Khumbhahwa* are the synonyms of *Pandu* .

In *Rigveda* and *Atharvaveda* *Pandu* has been described by the name of *Vilohita*, *Holima*, and *Haribha*⁶.

PANDU VYADHI KRAMA-

- **Acharya Charaka** has mentioned *Pandu* after *Grahani roga* – Treating *Grahani chikitsa* with *Theekshnadi dravyas* because of this increased *pitta* and produces *Pandu*⁷.
- **Acharya Sushruta** has mentioned *Pandu roga* after *Hridroga*-
Sankhyasamanyath- Types of *Pandu* and *Hridroga* are same. *Hridroga Chikitsa* with *Theekshamlakatukadi dravyas* increases *pitta* and produces *Pandu*⁸.
- **Ashtanga Hridaya and Ashtanga sangraha**- Acharya Vagbhata has mentioned *Pandu roga* after *Udara*. As there is *Tridosha sanchaya* is seen in both *Udara* and *Pandu* and *Twakmamsadi dushyas* are common in *Udara* and *pandu roga*⁹.

Role of *Rasavaha srothas* in *Pandu roga*-

Ahara rasa is the pure and minutest essence of well digested food. *Rasa dhatu* is the first formed *dhatu* from the *Ahara rasa*. *Rasa dhatu* is formed in *Rasavaha srotases* where *Dhatvagni* of *Rasa dhatu* plays a vital role in it.

Rasa dhatu main function is *Preenana* (Gratification) and *Raktha poshana* (nourishment of corresponding *Rakta Dhatu*). The tissue mainly Plasma i.e, *Rasa* is circulating type nutrients and the function mainly is giving nutrition by the *Rasavaha Srotas*. And blood i.e, *Rakta* is haemoglobin portion of blood and giving oxygen supply by *Rasavaha srotas* and *Raktavaha Srotas* too.

Unobstructed *srotases* allow manufacture of new tissues and proper flow of nutrients and waste materials. Impaired functions of *Srotas* lead to stagnation of *Doshas*, *dhatu*s, and *malas* in the *srotases* of the respective *dhatu*s. Hence, improper *Ahara* leads to the *Rasa-vaha sroto dushti* and this result in the formation of '*Panduroga*'¹⁰.

Nidana sevana and improper absorption
Agnidushti
Dhatu kshaya
Inadequate rasa dhatu
Shoshitha rasa dhatu circulates in the body
Sarva
dhatu poshana hampers

NUTRITIONAL DEFICIENCY DISORDER

***NIDANA OF PANDU ROGA*¹¹-**

The word *nidana* is having a multidimensional meaning and it includes majority of facts like *nidana panchaka*, the causative factor, and even the symptomatology, but here the causative factor of the disease is being considered.

Nidanas are broadly **classified into four groups** on the basis of the time limitations and intensity being taken by the causative factor to manifest the disease. They are =

- 1] *Sannikrusta hetu* 2] *Viprkrusta hetu*
- 3] *Vyabhichari hetu* 4] *Pradhaanika hetu*.

I] *SANNIKRUSTA HETU*:

The factors which are nearest to the disease and which directly goes into *prakopa Avastha* without undergoing to *sanchaya avastha* and having diurnal and seasonal influence over it is called *sannikrusta hetu*. The *sannikrusta hetu*'s of *Pandu roga* are :

***Bahya*:** *Mrudbhakshana*, *Abhighata*,

***Abhyantara*:** *Doshas (Vata, Pitta, Kapha)*, *Sahaja*.

***Mridbhakshana janya*:** *Kashaya Mrith* causes *Vataja pandu roga*, *Ushara Mrith* causes *Pittaja pandu roga*, and *Madhura Mrith* causes *Kaphaja pandu roga*.

Abhighata janya : Bahya and Abyantara.

2] **VIPRAKRUSTA HETU:**

The factors which takes time to manifest the disease depending upon the *dosha bala* and *hetu guna*'s is called *viprakrusta hetu*, and the common reason for all the diseases is *asaatmendriyarthaa aadi karana* and *adharmaa*. The *hetu*'s are =

- 1) *Aaharaja*, 2) *Viharaja*, 3) *Krimija*,
- 4) *Manasika karana* 5) *Nidanarthaka rogas*. 6) *Vaidya krita*.

3] **VYABHICHARI HETU :**

The causative factors which are not so strong enough to vitiate the *dosha*'s to that extend in order to manifest the disease i.e. due to *alpa dosha* and also due to the counteraction of the *vyadhi kshamatva* of the body delaying the disease manifestations

The disease manifests when the *dosha*'s are *pravara* and *vyaadhi kshamatva* is *avara*.

All the *Viprakusta hetu* can be considered in this.

4] **PRADHAANIKA HETU:**

Due to it's *ugra swabhava* one which is causing spontaneous *dosha* vitiation and manifesting the disease is called *pradhanaika hetu*.

Visha kalpas- Various *visha kalpas* causing spontaneous *dhatu dusti* and *raktalpata* as in case of G6PD Deficiency if anti malarial drug is given it causes haemolysis.

Abhighat: severe bleeding.

The *Samanya nidana* of *Pandu roga* mentioned in *Charaka*, *Sushrutha* and other *Samhithas* can be broadly classified into 3 groups. (*Charaka chikitsa* 16/8, *Sushrutha uttarasthana* 44/3)

- *Aharaja Nidana*
- *Viharaja Nidana*
- *Manasika Nidana*
- Other diseases i.e, *Nidanarthaka roga*.

Aharaja Nidana-

Food or diet plays an important role in the normal development and maintenance of different *dhatu*s as well as in the vitiation of *dosha*.

- Excess intake of *Kshara* (alkaline). *Amla* (sour), *Lavana* (salt), *Ushna* (hot) and *Teekshna* (penetrating) *Ahara*.
- The food/*Ahara* which is *Virudhha* (incompatible) and *Asatmya* (unwholesome).
- Intake of *Nishpava*, *masha*, *pinyaka* and *tila taila* in excess.
- Excess consumption of wine (*Madhya*), eating mud (*Mrit*) and *Mridu ahara*.

Viharaja Nidana-

- Excessive *Diwaswapna*, *Vyayama* and *Maithuna*.
- *Prathikarama Vaishamya* (faulty administration of *Panchakarma*) and *Ritu Vaishamya* (faulty management of seasonal regimen)
- Suppression of natural urge (*Vega Dharana*)

Manasika Nidana-

- *Manasika Nidana* i.e, anxiety, fear, anger and grief have a major role in the manifestation of *Pandu*.

Other/Secondary/Nidanarthaka causes-

In Ayurvedic literature there is an indication of a correlation between various diseases and *Pandu roga* either as a *Lakshana* of various diseases or as a *upadrava Swarupa*. So, all these diseases can be considered as a *Nidana* for *Pandu roga*, which directly or indirectly vitiate *doshas* in our body and finally manifests *Pandu roga*.

NUTRITIONAL REQUIREMENTS FOR ERYTHROPOIESIS¹²-

New red cells are being produced each day for which the marrow requires certain essential substances. These substances are as under –

1. Metals-

Iron is essential for red cell production because it forms part of the haem molecule in haemoglobin. Its deficiency leads to **iron deficiency anaemia**. Cobalt and manganese are certain other metals required for red cell production.

2. Vitamins-

Vitamin B12 and folate are essential for biosynthesis of nucleic acids. Deficiency of B12 or folate causes *megaloblastic anaemia*. Vitamin C (ascorbic acid) plays an indirect role by facilitating the iron turnover in

the body. Vitamin B6 (Pyridoxine), Vitamin E (tocopherol) and riboflavin are the other essential vitamins required in the synthesis of red cells.

3. Amino acids-

Amino acids comprise the globin component of haemoglobin. Severe amino acid deficiency due to protein deprivation causes depressed red cell production.

PANDU ROGA AND ANAEMIA-

The *Samanya lakshana* of *Pandu roga* simulates the clinical features of Anaemia. The resemblance of General features of *Pandu roga* and Anaemia are as follows-

PANDU ROGA	ANAEMIA
<i>Karnakshweda</i>	Tinnitus
<i>Hathanala</i>	Poor appetite
<i>Durbala</i>	Weakness
<i>Annadwesa</i>	Anorexia
<i>Shrama</i>	Fatigue
<i>Brahma</i>	Dizziness
<i>Shwasa</i>	Breathlessness
<i>Mrudithairiva Gatrischa</i>	Numbness and tingling sensation of hands and feet
<i>Hathaprabha</i>	Pallor in the skin and loss of lusture
<i>Pindikodveshtana</i>	Intermittent claudication of the legs
<i>Kati ruk</i>	Acute pain in the back
<i>Arohana ayasa</i>	Dyspnoea on exertion
<i>Gourava(Kriya su Asamarthyam)</i>	Loss of stamina

SAMPRAPTI OF PANDU ROGA-

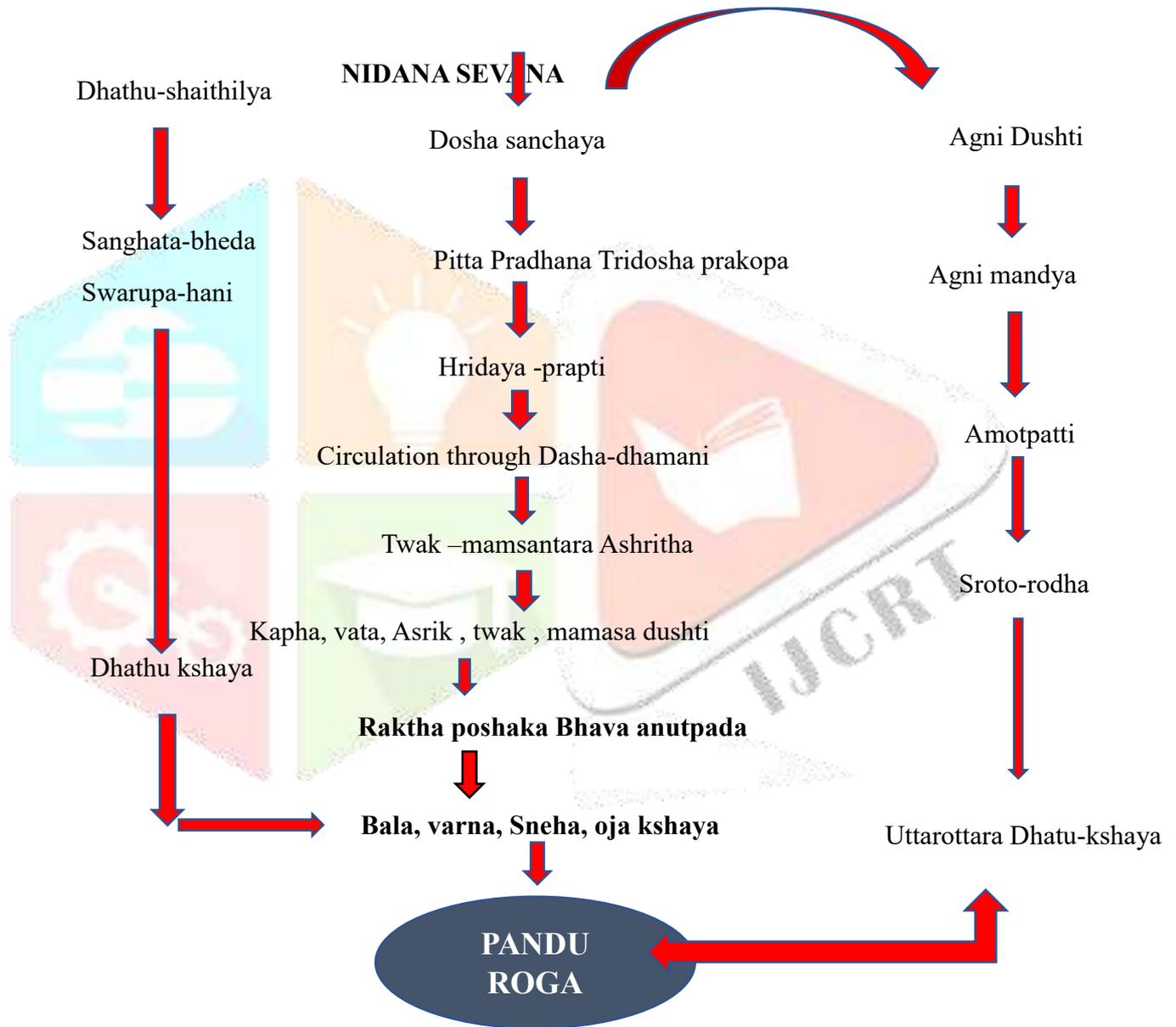
Acharya Charaka has mentioned the *Samprapti* of *Pandu* in *Chikitsa Sthana*. According to him, due to excessive consumption of *Kshara*, *lavana adhika ahara vihara nidana sevana* leads to the *Pitta pradhana dosha prakopa* this leads to the *Dhatu Pradhushana* of *Rakta*.

Vitiated *Pitta* in the *Hridaya* due to *Kupitavata* gets expelled out of its *Sthana* and enters the *Dashadhamanis* and spreads throughout the body and gets setteled in between the *Tvacha* and *Mamsantara* and does the further vitiation of the *Kapha*, *vata*, *tvacha*, *rakta*, *mamsa* and manifesting into the disease

Pandu roga which shows the *Pandu, Harita, Haridradi, Vivarnata* of *Twacha* and also shows the *Lakshanas* like *Alparaktha, meda, Nissarata Shitilendriyata* etc. *lakshanas*¹³.

According to Vagbhata-

Vagbhatacharya follows the *Samprapti* told by *Charaka*. He explains *Kopanirmalaha* which means *Kopana* of the *doshas* and the similar mechanism of disease manifestation is considered as like *Charaka*¹⁴.



As *Pandu* is a *nidana* for various diseases like in *Kamala* leading to different colouration in the body like *pandu*, *harita*, *haridra varna* on the skin. In the same way the long standing anaemia may produce Jaundice and produce different coloration like Lemon yellow, orange yellow and greenish yellow due to oxidation of Bilirubin and converted to biliverdin .

SAMPRAPTI GATAKA-

- ***Dosha- Pitta Pradhana Tridoshaja***
 - ❖ ***Pitta- Sadhaka, Ranjaka and Bhrajaka***
 - ❖ ***Kapha- Avalambaka, Kledaka***
 - ❖ ***Vata-Vyana Vayu***
- ***Dushya- Twak, Rasa, Rakta, Mamsa and Meda***
- ***Srotas- Rasavaha, Raktavaha***
- ***Sroto dushti- Sanga and Vimarga gamana***
- ***Agni- Jataragni and Dhatvagni.***
- ***Agni dushti- Mandagni***
- ***Udbhavasthana- Amashaya***
- ***Adhishtana – Twak mamsa abhyantara***
- ***Vyaktasthana-Twak***
- ***Sancharasthana- Twak and Mamsa***
- ***Svabhava-Chirakari***

Types of *Pandu roga*¹⁵ -

1. *Vataja Pandu roga*
2. *Pittaja Pandu roga*
3. *Kaphaja Pandu roga*
4. *Tridoshaja Pandu roga*
5. *Mridbhakshanajanya Pandu roga*

Classification according to **Acharya Sushruta-** Acharya Sushruta has not included *Mridbhakshanajanya Pandu roga*. Because according to him the variety of *Pandu* caused by *Mridbhakshana* is included in the *sannipatika* variety of *Pandu Samprapti* in General¹⁶.

CLASSIFICATION OF ANEMIA¹⁷

PATHOPHYSIOLOGIC

1. Anaemia due to increased blood loss
2. Anaemia due to impaired red cell production .
 - a) Cytoplasmic maturation defects
 - b) Nuclear maturation defects
 - c) Defect in stem cell proliferation and differentiation
 - d) Anaemia of chronic disorders
 - e) Bonemarrow infiltration
 - f) Congenital anemia
3. Anemia due to increased red cell destruction.

MORPHOLOGIC.

1. Microcytic, Hypochromic
2. Normocytic, Normochromic
3. Macrocytic, Normochromic
4. DEFICIENCY ANEMIAS

- **DISORDERS OF IRON METABOLISM-**
 1. Iron deficiency anemia
 2. Anemia of chronic diseases
 3. Sideroblastic Anemia
- **MEGALOBLASTIC ANEMIA-**
 1. Vit B12 deficiency
 2. Folate deficiency
 3. Deficiency of both Vit B12 and Folate
 4. Pernicious Anemia

VATAJA PANDU as NUTRITIONAL ANAEMIA.

In Keeping with the basic doctrines relating to causation of disease, Ayurveda considers that due to *Nidana sevana* the process of *Vataja Panduroga* is commenced with the *Prakopa* of *Pitta* and *vata*. The *Pitta dosha* takes leading part in the production of *Dhatushaithilya* and *Dhatugaurava*. Then occurs *Balakshaya*, *Varnakshaya*, *Snehakshaya* and *Ojakshaya* arising out of *Prakupita vata* along with *Prakupita pitta* in *Dosha Dushya Samoorchana*.

Various *Nidana* of *Vataja Pandu* will cause increase of *Ruksha* and *Laghu guna vriddhi* of *Vata*. On increase of *Ruksha guna* leads to symptoms such as *Krishna Pandutha*, *Varcha sosh*, *Rukshangatha*, *Krishna Nakha*, *Krishna Anana*, *Rooksha netra*, *Rooksha mutra*, *Rookshavit*, *Rooksha sira* etc. On increase of *Laghu guna* leads to *Balakshaya*, *kampa*, *Ruja* etc¹⁸.

Discussion-

The features of *Vataja Pandu* simulates the features of **Nutritional anaemia**. The Pathology of these could be the principle of Ayurveda which states that deficiency of a substance in the body leads to aggravation of *vata dosha*.

1. KRISHNA PANDUTHA-

Dark pigmentation over palms and soles in **Vit B12 and Folate deficiency**.

Deficiency of Vit B12 decreases the level of Glutathione, which activates tyrosinase and leads to transfer to melanosomes. Other most common causes of hyperpigmentation include systemic causes such as Addison's disease, hyperthyroidism, hemochromatosis, and certain primary skin disorders. Protein-energy malnutrition, zinc deficiency, and pellagra can also cause hyperpigmentation¹⁹

2. RUKSHARUNANGATHA-

Dry skin and brittle nails seen in **Iron deficiency anemia** and Beefy red tongue seen in **Cobalamin and folic acid deficiency**.

Koilonychia is relatively less common symptom of Iron deficiency, usually it begins as **brittle nails** and in later stages, when Iron deficiency continues untreated for long, it may lead to **Spoon shaped nails**²⁰.

For diagnosis of Cobalamin deficiency may be attributable to the rapid division of oral mucosal epithelial cells. Rapid regeneration of cells means that B12 deficiency- induced disorders of DNA synthesis are likely to manifest earlier than in other tissues.

Changes in cell structure and the epithelial keratinization pattern lead to formation of atrophic Stratified squamous epithelium, which appears as erythematous macules on clinical examination. Evidence from this study suggests that the oral "Beefy red" patch is a better clinical markers of **B12 deficiency** than MCV value cutoff serum cobalamin level <350pg/mL²¹.

3. ANGAMARDHA-

Easy fatigability in **Iron deficiency anemia**, Weakness in **Vit B12 and Folate deficiency**²²

When the body lacks iron and other nutrients, causes decreased haemoglobin in the body, without enough haemoglobin, less oxygen reaches the tissues and muscles, depriving them of energy.

4. **RUJA, TODA-**

Presence of neuropathy seen in **deficiency of vit B12, thiamine, Vit E, pyridoxine.**

Peripheral neuropathy indicates, there might be link between Iron metabolism, oxidative stress and ROS production.

Lack of B12 damages the myelin sheath that surrounds and protect nerves. Without this production, nerves cease to function properly and conditions such as Peripheral neuropathy occur.

5. **KAMPA-**

Tremors and shakiness in **Vit B12 deficiency.**

Tremors and other movement disorders are associated with Vitamin deficiency, most Vitamins B1, B6 and especially B12.

B12 is very important for keeping Nervous system in good working order. Severe lack of Vit B12 is rare, but shakiness and tremors can occur even in mild deficiency.

Plasma Homocysteine increases in Vitamin B12 deficiency, Increased level of homocysteine is related to number of Neurodegenerative diseases associated with neurotoxicity and over stimulation of N-methyl-D aspartate receptors²³.

6. **PARSHVA RUJA-**

Pain in the flanks seen in **cobalamin and Iron deficiency anemia.**

7. **SHIRORUJA-**

Light headedness in **Cobalamine deficiency**

8. **VARCHA SHOSHA-**

Constipation in **cobalamin and folic acid deficiency.**

At the low pH of the stomach, proteolytic digestion by pepsin occurs, which is the prerequisite for cobalamin release. Ileal pancreatic proteases are necessary as much as gastric peptic proteases to ensure optimal cobalamin absorption. IF secretion parallels the secretion of gastric acid, being stimulated by food and inhibited by H2 blockers, as well as by proton pump inhibitors. Long-term use of these two classes of drugs may lead to food-cobalamin malabsorption.

9. **ASYAVIRASYA-**

Altered taste in the mouth and anorexia seen in **IDA and Megaloblastic anemia**

10. **SHOPHA-**

Severe **Iron deficiency anemia** is associated with lower renal blood flow and various degrees of salt and water retention which leads to Edema in the foot.

In patients with Edema caused by chronic severe anaemia there is retention of salt and water, reduction of renal blood flow and glomerular filtration rate, and neuro hormonal activation similar to that seen in patients with edema caused by myocardial disease²⁴.

11. BALAKSHAYA-

Muscular weakness in **IDA** and **Megaloblastic anemia** , extreme fatigue and reduced work capacity in **IDA**.

When body lacks iron and other nutrients, less Hb is formed, and without enough Hb, less O₂ reaches the tissues and muscles depriving them of energy.

12. KRISHNA VARCHA-

Blackish stools in **IDA** due to sign of Intestinal bleeding.

Increased Blood loss due to Bleeding ulcer, chronic bleeding in GI tract (Stomach, small intestine, colon) causes diarrhoea with black, tarry stools²⁵.

MRUDBHAKSHANAJANYA PANDU-

Deficiencies in **Iron, calcium, zinc** and other nutrients (eg, Thiamine, niacine, vit C and D) have been associated with **pica**.

CONCLUSION-

Pandu roga is a *Varnopalakshitha* and a *pitta pradhana vyadhi* which is one of the most common and widespread diseases. *Pandu* is a *Rasavaha srotovyadhi* which simulates *Prathyatma lakshanas* of *Pandu* like *Hathaprabha*, *Hathanala*, *Arohana ayasa*, *Swasa* with the Hallmark features of Anaemia like Pallor, Dyspnea on exertion, loss of appetite and so on. *Pandu roga* is a multifactorial disease and its perceptions goes beyond the Anemia. *Lakshana* of *Vataja pandu* are parallel to the symptoms of Nutritional anemia. Examination of the patient through *Darshana pareeksha* may prove the milestone for Diagnosis.

REFERENCES-

1. <https://acrobat.adobe.com/id/urn:aaid:sc:AP:35bddb16-dc61-4755-a542-a7fcd0083397>.
2. <https://acrobat.adobe.com/id/urn:aaid:sc:AP:aca22d0e-666e-44b0-bea8-8fd3a8b1532b>.
3. Dr Chethan A.H, and Dr. R.Y Timmapur.(2019). Etiopathogenesis of Pandu roga w.s.r to Iron deficiency Anaemia on Literary study. Journal of Ayurveda and Integrated medical sciences, 4(05), 207-211. Available from: <https://doi.org/10.21760/jaims.v4i05.723>
4. <https://www.who.int/news-room/fact-sheets/detail/anaemia>.
5. Madhava nidana Madhukosha commentary Chaukhambha Sanskrit Sansthan 31st edition; c2002.
6. Ambika Datta Shastry, Sushruta samhitha, Uttara tantra, 7th edition, Chaukhambha Sanskrit Samsthan, Varanasi; c1990.p.286.
7. Charaka samhitha of Agnivesha, revised by charaka and Dridhabala with the Ayurveda Dipika commentary of chakrapanidatta edited by vaidhya yadavji Trikamji edition, Chikitsa sthana 16/1, ppno -526.

8. Sushruta samhitha, dalhana commentary, nibandha sangraha, chowkhamba orientalia varanasi,2009, uttaratantra, chapter 44/1 pgno 728.
9. Ashtanga Hrudaya, indu commentary, ayurveda Deepika, chowkhambha, Varanasi, chikitsasthana chapter 16.
10. Sharma Giriraj, Sharma Pooja. A Study on the role of Rasa-vaha srotas in Pandu Roga. AYUSHDHARA,2017;4(5):1317-1325. Available from:
<https://acrobat.adobe.com/id/urn:aaid:sc:AP:163fc015-7d62-4f4d-8394-29030d659472>.
11. Charaka samhitha of Agnivesha, revised by charaka and Dridhabala with the Ayurveda Dipika commentary of chakrapanidatta edited by vaidhya yadavji Trikamji edition, Chikitsa sthana 16/8, ppno -527.
12. Harsh Mohan, textbook of Pathology 8th Edition, P no 304.
13. Charaka samhitha of Agnivesha, revised by charaka and Dridhabala with the Ayurveda Dipika commentary of chakrapanidatta edited by vaidhya yadavji Trikamji edition, Chikitsa sthana 16/9-12, ppno -527.
14. Ashtanga Hrudaya, indu commentary, ayurveda Deepika, chowkhambha, Varanasi, chikitsasthana chapter 16.
15. Charaka samhitha of Agnivesha, revised by charaka and Dridhabala with the Ayurveda Dipika commentary of chakrapanidatta edited by vaidhya yadavji Trikamji edition, Chikitsa sthana 16/17, ppno -527.
16. Sushruta samhitha, dalhana commentary, nibandha sangraha, chowkhamba orientalia varanasi,2009, uttaratantra, chapter 44/5 pgno 729.
17. Harsh Mohan, textbook of Pathology 8th Edition, P no 309.
18. Charaka samhitha of Agnivesha, revised by charaka and Dridhabala with the Ayurveda Dipika commentary of chakrapanidatta edited by vaidhya yadavji Trikamji edition, Chikitsa sthana 16/17, ppno -527.
19. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9551622/>
20. Harsh Mohan, textbook of Pathology 8th Edition, P no 312
21. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6086100/>
22. Robbins and Catran, Pathologic basics of disease, 7th edition, pg no- 623
23. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC9551622/>
24. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1025332/#:~:text=CONCLUSION%2D%2DIn%20patients%20with,oedema%20caused%20by%20myocardial%20disease.>
25. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1774131/>