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THE INTEGRATIVE STUDY ON PANDU ROGA WITH REFERENCE TO RBC MORPHOLOGY

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ABSTRACT

Pandu Roga is a significant condition mentioned in *Ayurveda* under *Rasa-Rakta Dushṭi*, where the key feature is pallor of the body. It develops due to weakened digestive fire, improper habits, and disturbance of the *Tridosha* primarily *Pitta* and *Vata*. Modern hematology links these symptoms to different types of anaemia, especially those marked by changes in red blood cell (RBC) morphology. Integrating Ayurvedic concepts with current biomedical insights helps enhance the understanding of its pathogenesis, diagnostic approach and management strategies. This article examines *Pandu Roga* based on classical *Ayurvedic texts* and aligns it with modern observations of RBC morphology, including features like microcytosis, macrocytosis, anisocytosis and hypochromia.

KEYWORDS: Anaemia, *Pandu Roga*, *Ayurveda*, RBC Morphology.

INTRODUCTION

Ayurveda emphasizes the maintenance of health (*swasthasya swasthya rakshanam*) and the treatment of disease (*Aturasya vikara prashamanam*). The term *Pandu* originates from the root "*padi nasane*," combined with the suffix "*ku*" and further interpreted through "*ni*." Its meaning is consistently understood in the context of "*nashana*," which refers to loss or depletion. *(shabdakalpadruma part 3).* (*'Pandustu Peetbhagardhm Ketki dhulisannibham*') means *Pandu* is like colour of pollen grains of *ketaki*- Flower which is whitish-yellow.[1] *Ayurveda* has described *Pandu Roga* as a disease characterised by change of the normal colour of the body to different degree of pale-ness (dull red, pale yellow and white in successive stages) and that *Rakta* is the chief *Dusya*. We have seen earlier that it is the red corpuscles which are responsible for imparting bright red colour to the blood and the entire body. Its increase or decrease profoundly affects the colour of the blood and the whole body increase causing angry red appearance all over and decrease producing pale or whitish appearance.[2] The symptoms of *Pandu* as mentioned in *Ayurvedic* texts show similarities with the disease Anemia and Anaemia is one of the most common causes of paleness so *Pandu Roga* can be correlated with Anaemia. Microcytic, MCV, MCH, MCHC are all reduced e.g. in iron deficiency anaemia and in certain non-iron deficient anaemia (Hemolytic anaemia, thalassaemia, anaemia, Aplastic anaemia of chronic disorders) Although *Ayurveda* explains the disease in terms of disturbances in *Dosha*, *Dhatu*, *and Agni*, modern hematology focuses on evaluating blood indices and red blood cell morphology. Integrating these viewpoints improves both diagnostic accuracy and the planning of effective treatment.

AIM AND OBJECTIVE

- To study *Pandu Roga* in detail through Ayurvedic literature.
- To evaluate the clinical presentation of *Pandu* in contemporary populations through observational survey.
- To correlate different types of *Pandu* with RBC morphology and modern haematological parameters.
- To develop an integrative understanding for better diagnosis and future research.

MATERIAL AND METHODS

Material related to *Pandu Roga and* Anaemia collected from text book of Ayurveda, commentaries and modern medicine respectively. An observational study was conducted to integrate *Ayurvedic* understanding of *Pandu Roga* with modern haematological findings, with special reference to RBC morphology.

NIDANA OF PANDU ROGA (Etiological factors)[3-5]:

Nidana of *Pandu Roga* according to *Brihatrayi* are classified as *Aharaj*, *Viharaj* and *Manasika Nidana* has been listed in Table.

Table no. 1: *Aharaj nidana* of *pandu Roga.*

AHARAJ NIDANA	*CH.S.*	*SU.S.*	*A.H.*
Amla, Lavana Rasa	+	+	+
Atiushana	+	-	-
Virudhasana	+	-	-
Atitikshana	+	+	+
Asatmaya Bhojana	+	-	-
Nishpav, Mash,Pinyaak sevana	+	-	-
Vidagdha Anna Sevana	+	-	-

Table no. 2: *Viharaj nidana* of *pandu Roga.*

VIHARAJ NIDANA	*CH.S.*	*SU.S.*	*A.H.*
Divaswapna	+	+	+
Ativyayama	+	+	+
Vegdharana	+	-	+
Pratikarma Ritu	+	-	-
Veshymata	+	-	-

Table no. 3: *Mansik nidana* of *pandu Roga.*

MANSIKA NIDANA	*CH.S.*	*SU.S.*	*A.H.*
Kaama, Chinta, Bhaya, Shoka, Krodha	+	-	-

Types of *Pandu Roga*

- ***Vataja Pandu***
- **Pittaja Pandu**
- **Kaphaj Pandu**
- **Sannipataja Pandu**
- ***Mridbhakshanjanya Pandu***

***PURVARUPA*(Prodromal Features)**

Prodromal features of *Pandu Roga* has been listed in table No.4.

Table no. 4: *Purvarupa* (Prodromal Features).

SN	Prodromal Features	*Charaka*[10]	*Sushruta*[11]	*A.H.*[12]
1.	*Hrid spandana*	+	-	+
2.	*Raukshya*	+	-	+
3.	*Swedabhava*	+	-	+
4.	*Shrama*	+	-	-
5.	*Twak Sfotana*	-	+	-
6.	*Shthivana*	-	+	-
7.	*Gatrasaada*	-	+	-
8.	*Mrudbhakshanechha*	-	+	-
9.	*Akshikoota Shotha*	-	+	-
10.	*Vidmutra*	-	+	+
11.	*Avipaka*	-	+	+
12.	*Aruchi*	-	+	+
13.	*Agnimandya*	-	+	+

***RUPA* (Symptoms)[6-9]**

Samanya Lakshana of Pandu

Karnakshweda, Hatanala, Daurbalya, Sadana, Annadwesha, Shrama, Bhrama, Gatrashool, Jwara, Swasha, Gaurava, Aruchi, Gatramarda, Shunakshikutashotha, Harita, Shishiradweda, Nidralu, Shthiv ana, Alpawaka, Pindikodweshtanam Katiurupadaruka.

Vishishta Lakshana of Pandu

1. Vataja Pandu Roga- Table No.5.

Vataja Lakshana	***CH.S.***	***SU.S.***	***A.H.***	***MA.N.***
Krishna Pandu twaka	+	+	+	+
Shiroruka(headache)	+	-	+	-
Angamarda (Bodyache)	+	-	-	-
Kampa (Tremors)	+	-	+	+
Aasyaverasya **(**Distaste in Mouth)	+	-	+	-
Balakshaya (weakness)	+	-	+	-
Bhrama	+	-	+	+

2. Pitttaja Pandu Roga-Table No.6.

Pittaja Lakshana	***CH.S.***	***SU.S.***	***A.H.***	***MA.N.***
Peeta Gatra	+	+	+	+
Jwara, Daha, Trushna	+	+	+	+
Sweda	+	-	+	-
Amloudgara	+	-	+	-
Bhinna Varcha	+	-	+	-
Murchha	+	-	+	-
Katuvakrata	+	+	-	-

3. Kaphaja Pandu Roga-Table No.7.

Kaphaja Lakshana	***CH.S.***	***SU.S.***	***A.H.***	***MA.N.***
Shukla Netra	+	+	-	+
Chhardi	+	+	-	-
Romaharsha	+	-	+	-
Aalasya	+	-	+	+
Gaurava	+	-	-	+
Praseka	+	-	-	+
Saada	+	-	-	-

4. Mridbhakshanjanya Pandu Roga-Table NO.8.

Mridbhakshanjanya Pandu Lakshana	***CH.S.***	***A.H.***	***MA.N.***
Akshikoota shotha	+	-	-
Asya shotha	+	+	+
Arsha	-	-	+
Atisara	-	-	+
Bala kshaya	+	-	-
Krimi koshtha	+	-	-
Nabhi shotha	+	-	-
Purisha skapha	+	+	+
Purisha skrimi	-	+	-
Pada shotha	+	+	+

Samprapti of Pandu Roga[10]

When a person's *Dhatus* become disturbed due to an excessive aggravation of *pitta Doṣha*, the tissues lose their firmness and the body feels heavy. As the *Doṣha* and the affected tissues deteriorate, qualities such as complexion, strength, and natural unctuousness become greatly reduced. Consequently, the individual develops deficiencies of blood, fat, and *ojas*, along with looseness of body structures and changes in normal complexion.

Samprapti Ghataka[11]

Dosha – *Pitta Pradhan Tridosha Prakopa.*
Dushya- Rasa, Rakta, Mansa.
Srotas - *Rasavaha, Raktavaha.*
Srotodushti Prakara -Sanga.
Adhishthaan -Sarvashriragata Twacha.
Aashaya -Aamashayoth.
Agni – *Rasagni, Raktagni and Jatharagnimandya.*
Vyadhi Svabhava -Chirakari.

Sadhyasadhyata - *Krichsadhya.*

Sadhyata Ashadhyata[12]
A long duration having produced (*Chirotpanna),* Excessive roughness *(Kharibhuta),* Swelling after a long duration *(Kalaprakarshat Shuno),* When the patient gets yellow vision (*Pitani Pashyatti, Baddha Alpa Vitaka).* If the patient passes scabulous, scanty stool with mucus and green colour *(Sakapha Harita Atisara),* Anxious expression *(Deena),* Whitish and excessively smeared limbs (*Shwetatidigdhanga),* Suffers from vomiting, fainting, and thirst (*Chhardi - Murchha Trushardita),* Whitish due to deficiency of blood (*Asrika Kshayad Shwetatvam).*

Samanya Chikitsa[13]
The patient of *Pandu Roga* after unction should be subjected to strong Emesis and Purgation. Patient should be managed with wholesome diet such as old Sali rice, barley and wheat with soup of green gram, meat soup of wild animals and birds.

Vishishta Chikitsa[14]
The treatment should be dominantly fatty in *vatika, bitter and cold in paitika and* pungent, rough and hot in *kaphaja* and *mixed* in *sannipatika type.* Some *Aaushadyoga Gaumutraharitki, Navayasachurna, Manduravataka, Yograja, Silajatuvataka, Punarnavamandura, Bijakarista, Dhatryarista.*

ANAEMIA
Anaemia is defined as a condition in which the haemoglobin concentration in the blood falls below the normal reference range appropriate for an individual's age and sex.[15]

Clinical features
Patients with anaemia may show no symptoms, especially when the decline in haemoglobin occurs gradually. A slow reduction in Hb permits Haemodynamic adaptation and improves the efficiency of oxygen transport in the blood. Increased levels of 2,3-BPG shift the oxygen dissociation curve to right, facilitating greater release of oxygen to the tissues. However, when blood loss is sudden, symptoms tend to be more pronounced, particularly among elderly individuals.[15]

Pathophysiology-The severity of anaemia can be classified as mild, moderate, or severe based on haemoglobin levels. A reduction in haemoglobin leads to a decreased oxygen-carrying capacity of the blood, which in turn triggers several compensatory physiological mechanisms, including:

- Enhanced release of oxygen from haemoglobin to the tissues
- Increased blood flow to peripheral tissues
- Maintenance of overall blood volume
- Redistribution of blood flow to ensure adequate oxygen supply to vital organs[16]

Symptoms-these are all non-specific-Fatigue, headaches and faintness, Breathlessness, Angina, Intermittent claudication, Palpitations.[17]

Signs- Pallor, Tachycardia, Systolic flow murmur, cardiac failure.[17]

Another method for identifying the presence of anaemia and assessing its severity is through evaluation of the red blood cell count, haematocrit (PCV), and red cell indices, including MCV, MCH, and MCHC, RDW.[18]

Classification of Anaemias- Various systems have been proposed for classifying anaemias. Among these, two widely accepted approaches are based on the underlying pathophysiology of anaemia and the morphological characteristics observed in the peripheral blood smear.

1. **Pathophysiological**-The severity of anaemia can be classified as mild, moderate, or severe based on haemoglobin levels. A reduction in haemoglobin leads to a decreased oxygen-carrying capacity of the blood, which in turn triggers several compensatory physiological mechanisms, including:

- Enhanced release of oxygen from haemoglobin to the tissues
- Increased blood flow to peripheral tissues
- Maintenance of overall blood volume
- Redistribution of blood flow to ensure adequate oxygen supply to vital organs.

2. **Morphological**-Based on red blood cell size, haemoglobin concentration, and red cell indices, anaemias are categorized into three types. 1. Microcytic, hypochromic 2. Normocytic, normochromic 3. Macrocytic normochromic.[19]

Hematological Parameters

- **HB%-** Hb% indicates the amount of haemoglobin present in the blood, measured in grams per decilitre (g/dL). It represents the oxygen-transporting ability of blood and serves as a key indicator in the evaluation of anaemia. Range of hb%-at adultmen 16(+2)g/dl and adult women (menstruating) 13(+2)g/dl. Adult women (post- menopasusal) 14 (+2) g/dl.[20]
- **PCV/HCT**-The buffy coat which forms at the top of the RBC column while doing the hematocrit estimation in a PCV tube after centrifugation contains leukocytes and platelets almost entirely. When smeared on a slide and examined after staining with Leishman stain one may detect immature white cells. nucleated red cells and plasma cells which may contribute to a definite diagnosis.[21] It provides the basis for calculating MCV and MCHC, which are crucial for the classification of anaemia. The necessary values include the PCV, RBC count, and haemoglobin percentage, considering 14.5 g of haemoglobin as 100%.[21]

$$\text{MCV-}\frac{\text{P.C.V. /1000ml of blood}}{\text{RBC in millions per cmm}}\quad\text{(cubic microns)}$$

MCV (mean corpuscular volume) reflects the average volume of a red blood cell and is expressed in cubic units. Normal range of M.C.V. is 80-96 cubic microns indicates **Normocytic**, M.C.V. higher than 100 cubic microns indicates **Macrocytic** and M.C.V. below 75 cubic microns indicates **Microcytic** anaemia.[22]

$$\text{MCH-}\frac{\text{Hb. in gm per 1000 ml of blood}}{\text{RBC in millions per cmm}}\quad\text{(micromicrogram)}$$

The normal range is 24-30 micromicrogram. M.C.H. below than 20 micromicrogram called **Hypochromic** and M.C.H. higher than 33 micromicrogram called **Hyperchromic.**

$$\text{M.C.H.C.-}\frac{\text{Hb.in gm /100ml of blood X 100 \%}}{\text{P.C.V./100ml}}$$

P.C.V./100ml

M.C.H.C. Mean Corpuscular Haemoglobin Concentration) indicates the average concentration of haemoglobin within a red blood cell. The normal range of M.C.H.C. is 32–36 %, which corresponds to the **Normochromic** state. When the M.C.H.C. value falls below 30 percent, it is termed **Hypochromic** and usually indicates **Iron deficiency.**[22]

RDW-Red cell distribution width (RDW) provides a quantitative measure of anisocytosis. It represents a statistical assessment of the variation in red blood cell size and is calculated from the standard deviation of red cell volume. Automated analyzers express RDW either in femtolitres (fL) as standard deviation or as a coefficient of variation derived from red cell volume distribution histograms, which enables easy detection of even mild anisocytosis. Mean corpuscular volume (MCV) alone may not accurately reflect red cell size abnormalities when only a small proportion of microcytes or macrocytes is present; in such situations, RDW serves as a more reliable parameter. The normal RDW range is approximately 42.5 ± 3.5 fL (standard deviation) or 12.8 ± 1.2% when expressed as coefficient of variation. RDW is therefore useful in the classification of anaemias and as an important indicator for morphological evaluation in clinical laboratory practice.[23]

In **megaloblastic anaemia**, the MCV and MCH values are increased, while the MCHC is usually normal and may occasionally be slightly reduced.[24] In **Haemolytic anaemia** MCV is generally normal or mildly reduced, whereas the MCHC is elevated.[23]

DISCUSSION

Pandu Roga and microcytic anaemia are rooted in a common clinical issue impaired blood function and lowered oxygen-carrying capacity. *Ayurveda* interprets this condition through a psychosomatic lens, focusing on disturbances in digestion and metabolism, while modern medicine attributes it to cellular and biochemical deficits. Combining insights from both traditions can enhance early detection, prevention, and comprehensive management of anaemia. An integrative approach combining *Ayurvedic* diagnosis with RBC morphological assessment enhances clinical precision and bridges the gap between traditional and modern medical systems. While *Ayurveda* emphasizes symptomatology and *Dosha* involvement, modern haematology offers objective parameters to substantiate these clinical findings. Such synergy strengthens evidence-based *Ayurvedic* practice and promotes rational, patient-specific management of *Pandu Roga*.

CONCLUSION

In summary, the article successfully integrates modern haematological diagnostic methods with *Ayurvedic* principles by emphasizing the role of peripheral blood smear analysis. The findings derived from PBS examination contribute to the precise identification of different forms of *Pandu* and support clinicians in formulating individualized, evidence-based therapeutic strategies. The convergence of contemporary laboratory investigations with traditional Ayurvedic concepts highlights the value of an integrative approach in the diagnosis and management of anaemia and related conditions, thereby improving overall patient care and therapeutic outcomes. Features of *Pittaja Pandu* were predominantly observed in patients suffering from haemolytic anaemia. In contrast, clinical features of other subtypes of *Pandu*, namely *Vataja* and *Kaphaja Pandu*, were commonly seen in deficiency anaemias, particularly in iron deficiency anaemia and megaloblastic anaemia, respectively. The article emphasizes the diagnostic importance of red blood cell morphology in the evaluation of different forms of anaemia. It describes the microscopic features of normal and abnormal red blood cells, focusing on variations in size, shape, and staining characteristics. Such morphological alterations provide valuable clues to underlying pathological conditions. For example, the presence of microcytic, hypochromic red cells is commonly indicative of *Vataja Pandu*, whereas macrocytic, hyperchromic cells are suggestive of *Kaphaja Pandu*. This systematic correlation between peripheral blood smear findings and Ayurvedic *doshic* predominance deepends the understanding of anaemia and its clinical presentations, thereby supporting more precise and targeted treatment strategies.

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