

PANDU ROGA AND IRON DEFICIENCY ANAEMIA: AN INTEGRATIVE VIEW OF AYURVEDA, MODERN HEMATOLOGY

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ABSTRACT

Rasa Dhatu is the primary *Dhatu* responsible for nourishment, hydration, and sustenance of all subsequent *Dhatus*. *Dhatu* which is circulated continuously in the body is called as *Rasa Dhatu*. Any pathological alteration in *Rasa Dhatu* results in *Rasa Dushti*, which manifests as both *Kshaya* (depletion) and *Vridhhi* (qualitative vitiation). Among the *Tridoshas*, *Pitta Dosha* plays a pivotal role in the pathogenesis of *Rasa Dhatu Dushti*. Aggravated *Pitta*, due to its *Ushna* (hot) and *Ruksha* (dry) *gunas*, leads to depletion of *Rasa Dhatu*, resulting in *Rasa Kshaya* and impairment of its nourishing function. Simultaneously, the *Amla guna* of *Kupita Pitta* causes qualitative derangement of *Rasa Dhatu*, producing *Vridhhi Lakshanas*. Thus, the simultaneous manifestation of *Kshaya* and *Vridhhi* reflects the complex involvement of *Pitta Dosha* in *Rasa Dhatu* pathology. Understanding this dual nature of *Rasa Dushti* is essential for accurate diagnosis and rational

Ayurvedic management. This conceptual analysis highlights the role of *Pitta Dosha* in *Rasa Dhatu* vitiation and provides a foundational framework for correlating classical Ayurvedic principles with clinical conditions such as *Pandu Roga*. *Kasisa* and *Godanti Bhasma* together break the pathogenesis of *Pandu Roga*. *Kasisa* improves *Rakta Dhatu* and hemoglobin by

KEYWORDS: *Pandu Roga*, Iron Deficiency Anaemia, *Rasa Dhatu*, *Pitta Dosha*, Integrative Medicine.

As the main nourishing tissue responsible for maintaining all other *Dhatus*, *Rasa Dhatu* holds a crucial role in Ayurvedic physiology. Classical texts describe *Rasa* as the continuously circulating essence that keeps the body hydrated, fed, and healthy. Maintaining the structural and functional integrity of the organism depends on the appropriate creation and circulation of *Rasa Dhatu*.

Rasa Dushti, which can present as *Kshaya* (quantitative depletion) or *Vridhhi* (qualitative vitiation), is caused by pathological changes in *Rasa Dhatu*. An imbalance in *TriDosha*, particularly *Pitta Dosha*, is strongly related to the development of *Rasa Dushti*. Aggravated *Pitta* interferes with the normal makeup and function of *Rasa Dhatu* because of its *Ushna* (hot), *Ruksha* (dry), and *Amla* (acidic) characteristics. The *Amla guna* causes qualitative derangement, whereas the *Ushna* and *Ruksha* characteristics cause depletion and inadequate nutrition. As a result, *Kshaya* and *Vridhhi* can coexist, demonstrating the complex and dynamic relationship between *Dosha* and *Dhatu*.

A prominent diagnostic feature of *Pandu Roga* is the pallor on the skin which occurs due to the quantitative and qualitative deficiency of *raktu Dhātu* (~blood tissue) caused either in the form of deficiency of hemoglobin and/ or red blood cells (RBCs). Considering *Panduta* (pallor) as the predominant sign, the disease is termed as *Pandu Roga*. The nearest correlation of iron deficiency anemia (IDA) can be made with *Pandu Roga*, because of the predominance of *Panduta* or pallor in the whole body.

AIM AND OBJECTIVE

To review the concept of *Pandu Roga* from Ayurvedic literature and its nearest correlation with anaemia. To explore *Pandu Roga* in correlation with *Iron Deficiency Anaemia (IDA)* through an integrative approach.

MATERIAL AND METHODS

Material has been collected from ancient Ayurvedic texts, Research Journals, and electronic databases. This study is a conceptual review based on classical Ayurvedic texts, including *Charaka Samhita* and *Sushruta Samhita*, and *Astanga hridaya* along with contemporary literature from modern hematology. Ayurvedic principles related to *Rasa Dhatu*, *Pitta Dosha*, *Pandu Roga*, were critically analyzed and interpreted in the context of modern concepts such as iron metabolism, hemoglobin synthesis, and anaemia.

REVIEW OF LITERATURE

The term "*Pandu*" is derived from the root "*Padi Nasane*," which is modified by the suffix "*Ku*" and further clarified by "*Ni*." It is generally used to express the notion of "*Nashana*," which means loss. (*Shabdakalpadruma* - Part 3).

Table No. 1: Defination of *Pandu* By Various Acharyas.

According to Vachaspatyam	^[2] (Vachaspatyam Part-5) <i>Pandu</i> as a mixture of white and yellow colours which resembles the pollen grains of the <i>Ketaki</i> Flower.
Amarakosha	^[3] <i>Pandu</i> means a white colour mixed with a yellowish tinge
According to Acharya Charaka	^[4] Disease in which patient's skin exhibits discolouration that may appear as <i>Pandu</i> or take on a yellowish (<i>haridra</i>) or greenish hue.
According to Acharya Sushruta	^[5] All varieties of <i>Pandu</i> cause the patient's body to show a more visible <i>Pandu</i> appearance (<i>shweta Rakta</i> or <i>shweta pita</i>), which is why the illness is known as <i>Pandu</i> .
According to Acharya Vagbhatta	^[6] The ailment is known as <i>Pandu</i> since it includes so much <i>Panduharidraharita</i> and <i>Pandutva</i> .
According to Acharya Madhavacharya	^[7]

Following digestion, the nutritive essence of food (*Ahara Rasa*) is sequentially distributed to the bodily tissues (*Dhatus*) for their nourishment. This process is classically compared to watering the roots of a tree, wherein the water reaches all parts of the plant, although the formation of the trunk, branches, leaves, flowers, and fruits occurs in a definite and orderly sequence. In a similar manner, *Rasa Dhatu* circulates throughout the entire body, reaching every cell, while the subsequent *Dhatus*—such as *Rakta*, *Mamsa*, and others—are formed successively in a predetermined order.

When *Rasa Dhatu* is well formed with adequate quality (*guna*) and quantity (*pramana*), it ensures proper nourishment and transformation into the next *Dhatu*, *Rakta Dhatu*. Pure, well-circulated *Rasa* possessing normal *snigdhatva*, *sara*, and *Prasannata* effectively supplies essential nutrients and vitality required for *Rakta utpatti*. Balanced *Rasa Dhatvagni* facilitates the efficient conversion of *Rasa* into *Rakta*, resulting in blood that is sufficient in volume, rich in color, and capable of performing its physiological functions. Conversely, any qualitative impairment or quantitative deficiency of *Rasa* leads to defective *Rakta* formation. Thus, the excellence of *Rakta Dhatu* is fundamentally dependent on the optimal state of *Rasa Dhatu*, establishing *Rasa* as the primary determinant of healthy blood formation.

Table no. 2: Normal *Karma* of *Rasa Dhatu*.

<i>Karma</i> of Rasa Dhatu acc. to acharyas	<i>Karma</i>
Vagbhat	[8]
Sushrut	[9] [10]

Table No. 3: *Rasa Dhatu Kshaya Vridhi Lakshana.*

<i>Rasa Dhatu</i> <i>Kshaya lakshana</i>		
<i>Rasa Dhatu</i> <i>vridhhi lakshana</i>		

Role of *Pitta Dosha* in *Pandu*

In *Pandu Roga*, *Pitta Dosha* plays a central role in the *Kshaya* as well as *Vridhhi* of *Rasa Dhatu*. Owing to its *ushna* and *ruksha guna*, aggravated *Pitta* impairs *Rasa Dhatvagni*, leading to improper metabolism and qualitative deterioration of *Rasa Dhatu*, which manifests as *Rasa Kshaya*. Simultaneously, due to the *amla guna* of *Pitta*, abnormal accumulation and vitiation of *Rasa* occurs, producing *Rasa Vridhhi lakshana* in a dysfunctional form. Thus, *Pitta* causes both depletion and vitiation of *Rasa Dhatu*, resulting in *Dhatu dusthi*. And in *Pandu Roga* This deranged *Rasa* subsequently fails to nourish *Rakta Dhatu* adequately, ultimately manifesting as *Pandu Roga*.

Symptoms of *Pandu*^[14]

सम्भूतेऽस्मिन् भवेत् सर्वः कर्णक्ष्वेदी हतानलः। दुर्बलः सदनोऽन्नद्विट् श्रमभ्रमनिपीडितः॥१३॥

गात्रशूलज्वरश्वासगौरवारुचिमान्नरः। मृदितैरिव गात्रैश्च पीडितोन्मथितैरिव॥१४॥

शूनाक्षिकूटो हरितः शीर्णलोमा हतप्रभः। कोपनः शिशिरद्वेषी निद्रालुः ष्ठीवनोऽल्पवाक्॥१५॥

पिण्डिकोद्वेष्टकट्यूरुपादरुक्सदनानि च। भवन्त्यारोहणायासैर्विशेषश्चास्य [१] वक्ष्यते॥१६॥

The classical clinical features of *Pandu* described in Ayurvedic texts show a strong correlation with the symptomatology of anemia in modern medicine. *Panduta* (pallor) corresponds directly to the pale skin and mucous membranes observed in anemic patients due to reduced hemoglobin levels. *Daurbalya* (weakness), *Shrama* (easy fatigability), and *Kshaya* (emaciation) parallel the generalized fatigue and reduced exercise tolerance seen in anemia as a result of decreased oxygen-carrying capacity of blood. *Hridspandana* (palpitations) and *Shwasa* (dyspnea) resemble the compensatory tachycardia and breathlessness experienced in moderate to severe anemia. *Aruchi* (loss of appetite) and *Agnimandya* (impaired digestion) correlate with reduced metabolic efficiency and gastrointestinal disturbances commonly observed in chronic anemia. Furthermore, symptoms such as *Gaurava* (heaviness) and reduced *Kriyasamarthyas* (functional inefficiency) reflect the diminished tissue oxygenation and impaired cellular metabolism described in modern pathophysiology. Thus, the clinical presentation of *Pandu* can be meaningfully understood in light of contemporary hematological concepts, highlighting a significant conceptual overlap between Ayurvedic and modern descriptions of anemia.

According to WHO Anaemia is a condition in which the number of red blood cells or the haemoglobin concentration within them is lower than normal. It mainly affects women and

children. Anaemia occurs when there isn't enough haemoglobin in the body to carry oxygen to the organs and tissues resulting in pallor of mucous membrane/nail bed or palmar creases, and many more other symptoms.

A significant worldwide health problem particularly impacting Vulnerable groups include young children, women of reproductive age and expectant women. Its distinguishing feature is that a decrease in the number of red blood cells causes this. Because of insufficient iron reserves, hemoglobin levels fall, therefore causing insufficient oxygen distribution and a range of systemic exhibits. As a result, individuals with IDA often exhibit tiredness, weakness, pallor, and reduced cognitive performance; which may negatively affect productivity and quality of life.

Iron-deficiency anemia (IDA) is a major global health problem, particularly affecting infants and young children. Iron is an essential element not only for hemoglobin synthesis but also for cellular immune function and mitochondrial oxidative metabolism, where it plays a key role in energy production.

Oxidative stress refers to a pathological imbalance between the generation of reactive oxygen species (ROS) and the body's antioxidant defense system. When ROS production exceeds antioxidant capacity, cellular components may undergo irreversible damage. Free radicals exert their harmful effects by oxidizing lipids in cell membranes (lipid peroxidation), modifying proteins, damaging carbohydrates, and inducing DNA oxidation within organelles and the nucleus.

Under normal physiological conditions, ROS are neutralized by a complex antioxidant system that includes enzymatic antioxidants (such as superoxide dismutase, catalase, and glutathione peroxidase) and non-enzymatic antioxidants (such as vitamins C and E). However, several studies have demonstrated that patients with iron-deficiency anemia exhibit increased levels of oxidants along with reduced antioxidant defenses. As a result, the oxidative-antioxidative balance shifts toward a pro-oxidant state, contributing to cellular dysfunction and tissue damage in these patients.

Oxidative stress refers to a pathological imbalance between the generation of reactive oxygen species (ROS) and the body's antioxidant defense system.^[15] When ROS production exceeds the antioxidant capacity, it leads to damage of cellular components. Free radicals exert

harmful effects through lipid peroxidation of cell membranes, protein modification, carbohydrate damage, and DNA oxidation.^[16]

Under normal physiological conditions, ROS are neutralized by antioxidant defense systems, including enzymatic antioxidants such as superoxide dismutase, catalase, and glutathione peroxidase, as well as non-enzymatic antioxidants like vitamins C and E. However, studies have shown that patients with iron deficiency anaemia exhibit increased oxidative stress markers along with reduced antioxidant levels, resulting in a shift toward a pro-oxidant state, which contributes to cellular dysfunction and tissue damage.^[17]

Table No. 4: Symptoms describe in classical text of ayurveda and its possible modern explanation.

Symptom	Role of Hypoxia (Primary Mechanism)	Role of Oxidative Stress (exacerbating mechanism)	Integrated Modern Explanation
Fatigue (Daurbalya)	↓ Hemoglobin → ↓ O ₂ delivery → ↓ ATP production in muscles	ROS damage mitochondrial membranes → lipid peroxidation → further ↓ energy efficiency	Energy deficiency + oxidative mitochondrial injury causes persistent fatigue
Myalgia (Gatrashoola)	Muscle hypoxia → anaerobic Glycolysis → lactic acid accumulation	ROS induce membrane damage and micro-inflammation in muscle fibers	Hypoxia initiates pain; oxidative stress sustains inflammatory irritation
Palpitations (Hridspandana)	Compensatory ↑ cardiac output due to low oxygen	Oxidative endothelial dysfunction → NO imbalance → ↑ sympathetic tone	Hyperdynamic circulation worsened by oxidative vascular stress
Dizziness (Bhrama)	Cerebral hypoxia → transient neuronal dysfunction	ROS damage neurons and impair neurotransmitter synthesis	Brain hypoxia + oxidative neuronal injury causes giddiness
Tinnitus (Karnashwedi)	Reduced cochlear oxygenation	Hair cells highly sensitive to ROS → ion channel dysfunction	Auditory hypoxia + oxidative injury triggers abnormal neural firing
Cold intolerance (Shishiradweshi)	↓ Oxidative metabolism → ↓ heat production	ROS impair mitochondrial thermogenic pathways	Reduced heat generation compounded by mitochondrial oxidative dysfunction

Loss of luster (Hataprabha)	Poor tissue oxygenation → reduced cellular turnover	ROS cause collagen degradation & membrane lipid peroxidation	Epithelial hypoxia + oxidative skin damage → dull appearance
Anorexia (Aruchi)	Reduced gastric mucosal oxygen → ↓ HCl secretion	ROS injure gastric epithelial cells	Hypoxia impairs secretion; oxidative stress damages mucosa
Lethargy) (Nidralu)	Reduced cerebral oxygenation → ↓ cortical activation	Oxidative stress impairs reticular activating system	Combined hypoxic and oxidative brain suppression causes somnolence

Table No. 5: Qualitative and Quantitative aspect of *Rasa Dhatu*.

Aspect	Ayurvedic perspective	Mordern perspective
Quantitative Aspect (<i>Kshaya</i>)	<i>Rasa Kshaya</i> denotes reduction in the <i>pramana</i> (quantity) of <i>Rasa Dhatu</i> , leading to inadequate nourishment of <i>Rakta Dhatu</i> . Since <i>Rakta</i> is formed from <i>Rasa</i> , decreased <i>Rasa</i> directly results in <i>Rakta Kshaya</i> . Clinically manifests as <i>Panduta</i> (pallor), <i>Daurbalya</i> (weakness), and reduced strength. This represents insufficiency in blood formation.	Corresponds to measurable reduction in blood parameters such as decreased hemoglobin concentration, reduced RBC count, and low hematocrit (PCV). These indicate diminished oxygen-carrying capacity due to reduced red cell mass — a hallmark of anemia.
Qualitative Aspect (<i>Vridhhi / Dushti</i>)	Explained as <i>Rasa Vridhhi</i> in a <i>Dusta</i> form, mainly due to <i>Pitta</i> aggravation. Though <i>Rasa</i> may appear present in normal quantity, its <i>guna</i> and <i>karma</i> are impaired. Vitiated <i>Rasa</i> fails to properly nourish <i>Rakta</i> , leading to functionally weak, pale, and unstable <i>Rakta</i> (<i>Rakta Dushti</i>) rather than pure depletion	Refers to defective composition and function of blood despite presence of blood volume. Includes hypochromic or microcytic RBCs, defective hemoglobin synthesis, and deficiency of plasma constituents such as iron, albumin, vitamin B12, folate, and transport proteins. These result in ineffective erythropoiesis and reduced functional efficiency.

DISCUSSION

A decrease in the number of red blood cells, hemoglobin concentration, and iron levels represents a quantitative deficiency of blood. Due to this reduction, the oxygen-carrying capacity of blood is compromised, leading to inadequate tissue oxygenation. Clinically, this manifests as fatigue, shortness of breath, and palpitations. These features closely resemble the

Lakshanas of *Rasa Dhatu Kshaya*, where diminished *Rasa* fails to adequately nourish and support subsequent *Dhatus*, including *Rakta*.

On the other hand, *Rasa Vriddhi lakshana*, which resembles *Kapha Vriddhi lakshana* due to *Ashraya–Ashrayi Bhava*, reflects qualitative derangement rather than true increase. *Lakshanas* such as *Shwethata* (paleness) indicate impaired quality and functional inefficiency of *Rasa Dhatu*. In modern hematological terms, this can be correlated with the presence of hypochromic and microcytic red blood cells, where hemoglobin synthesis is defective. Although red blood cells may be present, their pale color and reduced size signify poor functional quality of blood rather than absolute deficiency.

Thus, *Pandu Roga* can be understood as a condition involving both quantitative depletion (*Rasa Kshaya*) and qualitative impairment (*Rasa Vriddhi*) of *Rasa Dhatu*. This dual pathology explains the coexistence of reduced oxygen delivery and impaired blood quality. Hence, the concepts of *Kshaya* and *Vriddhi* of *Rasa Dhatu* provide a comprehensive Ayurvedic explanation for both the poor quantity and poor quality of blood observed in iron deficiency anaemia.

In *Pandu Roga*, both *kshaya* and *vriddhi lakshana* of *Rasa Dhatu* are observed simultaneously. *Kshaya* primarily reflects a quantitative deficiency, resulting in reduced formation and volume of *Rakta Dhatu*, whereas *vriddhi* denotes qualitative impairment, wherein the blood formed is nutritionally and functionally inferior. Thus, *Pandu* represents an overall qualitative and quantitative deterioration of *Rasa Dhatu*, rather than a simple deficiency. From a modern perspective, iron deficiency anemia is characterized by depletion of plasma constituents such as albumin, ferrous iron, methylcobalamin, and other essential proteins, which are crucial for erythropoiesis. Since these nutrients are transported through plasma, their deficiency closely correlates with *Rasa Dhatu kshaya* and *vriddhi*, leading to defective *Rakta* formation and the clinical manifestations of *Pandu*. An integrative interpretation indicates that disturbance of *Rasa Dhatu* and deranged *Agni* are central to both Ayurvedic and modern viewpoints. The functional role of *Pitta* in metabolism may be linked with impaired iron absorption and utilization. The coexistence of *Kshaya* and *Vriddhi* reflects not only a reduction in quantity (hemoglobin deficit) but also qualitative dysfunction at the metabolic level.

In anemia, there is not only quantitative loss (↓ hemoglobin, ↓ RBC count) but also a qualitative impairment of blood tissue — such as increased oxidative stress, membrane fragility, inflammatory milieu, and poor marrow microenvironment.

CONCLUSION

Pandu Roga represents a dual pathology wherein quantitative loss of *Rasa* leads to reduced blood formation (*Rakta kshaya*), while qualitative vitiation of *Rasa* results in the production of functionally defective blood, correlating with iron deficiency anemia characterized by both reduced hematological indices and impaired blood quality. In *Pandu Roga*, both *Kshaya* and *Viruddhi lakshana* of *Rasa Dhatu* are observed.

This reflects a simultaneous qualitative and quantitative derangement of *Rasa Dhatu*, arising from impaired *Agni* and defective *Dhatu-poshana*, which ultimately contributes to the pathogenesis of *Pandu*.

Thus, *Pandu Roga* can be understood as a disorder of *Rasa Dhatu* characterized by both qualitative and quantitative *Dushti*. This is comparable to iron deficiency anemia, wherein there is not only a reduction in hemoglobin and iron stores (quantitative deficiency, reflected by low ferritin) but also deterioration in the functional quality of blood and plasma components such as albumin and globulins. Hence, *Pandu Roga* represents an overall qualitative and quantitative impairment of *Rasa Dhatu*, ultimately affecting *Rakta Dhatu* formation.

Several *nidanas*, including overindulging in *amla*, *lavana*, *kshara*, *viruddha ahara*, an unhealthy lifestyle, and psychological strain, can lead to *Pandu Roga*, a *Pitta-pradhana Tridoshaja Vyadhi*. Between *Tvacha* and *Mamsa*, these variables exacerbate *Pitta*, which is driven by *Vata* and spreads throughout the *dhamanis*. The end result is *Rakta Alpata*, *Dhatu shithilata*, reduced *varna* and *bala*, and ultimately pallor of the skin, which is clinically equivalent to anemia, due to vitiation of *Rakta* along with *Kapha* and *Vata*. Therefore, the basic pathology includes *Dhatvagni* dysfunction, *Pitta* aggravation, *Rakta Dhatu Kshaya*, and *Rasavaha–Raktavaha srotodushti*.

Pandu develops due to *Nidana* such as excessive intake of *Tikta*, *Katu*, *Amla* and *Lavana Rasa*, *Vishamashana*, *Diwaswapa*, *Chinta* and *Shoka*, which lead to *Pitta-pradhana Tridosha Prakopa*. Aggravated *Pitta*, particularly due to its increased *Drava* and *Amla* properties,

causes *Agnimandya*. Impaired *Agni* results in incomplete digestion and formation of *Ama*, which contaminates the *Ahara Rasa* and leads to *Rasa Dhatu Dushti*. Vitiating *Rasa* loses its functional capacity (*Kriyasamarthyā*) for proper nourishment and support (*Dharana* and *Poshana*), resulting in qualitative and quantitative depletion. Consequently, *Ranjaka Pitta*-mediated transformation of *Rasa* into *Rakta* becomes defective, leading to *Rakta Kshaya* and the classical features of *Pandu* such as pallor, fatigue, heaviness, and diminished strength. Progressive impairment further affects *Uttarottara Dhatus* and *Ojas*.

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