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CORRELATION OF *PANDU* WITH CHILDHOOD IRON DEFICIENCY ANAEMIA: A NARRATIVE REVIEW

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ABSTRACT

Background: Childhood Iron Deficiency Anaemia (IDA) remains one of the most common nutritional disorders worldwide, especially in developing countries. In *Ayurveda*, *Pandu* is described as a *Rasapradoshaja* and *Raktapradoshaja* Vyadhi characterized mainly by pallor, weakness, and loss of vitality. Classical descriptions of *Pandu* show striking clinical similarity with Iron Deficiency Anaemia seen in children. **Aim -**To study and correlate the concept of *Pandu* described in *Ayurveda* with Childhood Iron Deficiency Anaemia. **Objectives** To review classical *Ayurvedic* descriptions of *Pandu* with special reference to childhood. To compare the *Nidana*, *Lakshana*, and *Samprapti* of *Pandu* with Childhood Iron Deficiency Anaemia. To understand the relevance of *Ayurvedic* principles in the prevention and management of childhood anaemia. **Materials and Methods:** A narrative review was conducted using classical *Ayurvedic* texts including *Charaka Samhita*, *Sushruta Samhita*, and *Ashtanga Hridaya*,

along with contemporary medical literature related to childhood Iron Deficiency Anaemia. Conceptual correlations were drawn based on *Nidana*, *Lakshana*, *Samprapti*, and *Chikitsa Siddhanta*. **Results:** The clinical features of *Pandu* such as *Pandu Varna*, *Daurbalya*, *Shrama*, *Hridayaspandana*, and *Aruchi* closely resemble manifestations of childhood Iron Deficiency Anaemia. Etiological factors like *Alpa Ahara*, *Asatmya Ahara*, *Krimi*, and *Agnimandya* parallel poor dietary intake, malabsorption, and parasitic infestations in modern medicine. Pathogenetically, impairment of *Rasa* and *Rakta Dhatu* mirrors reduced hemoglobin synthesis. **Discussion:** The *Samprapti* of *Pandu* involves *Agni Dushti*, *Rasavaha Srotodushti*, and subsequent *Rakta Kshaya*, which aligns well with the pathophysiology of iron deficiency leading to anaemia. Childhood susceptibility can be explained by *Bala Avastha*, rapid growth demands, and immature *Dhatu Paripakva* status. *Ayurvedic* management principles focusing on *Deepana*, *Pachana*, *Raktavardhaka*, and *Rasayana* therapy provide a holistic approach to childhood IDA. **Conclusion:** A strong conceptual and clinical correlation exists between *Pandu* and Childhood Iron Deficiency Anaemia. Understanding this correlation supports the relevance of *Ayurvedic* diagnostic and therapeutic principles in the prevention and management of nutritional anaemia in children.

Keywords: *Pandu***,** Childhood Anaemia**,** Iron Deficiency Anaemia**,** *Rakta Dhatu***,** *Agnimandya***,** *Rasapradoshaja Vyadhi* etc.

Introduction

Childhood Iron Deficiency Anaemia is one of the most common nutritional disorders affecting children worldwide. It has a direct impact on growth, immunity, physical stamina, and cognitive development. Factors such as inadequate dietary iron intake, poor absorption, recurrent infections, parasitic infestations, and rapid growth demands make children especially vulnerable to this condition. If not identified and managed early, childhood anaemia can lead to long-term physical and mental consequences.[1]

In *Ayurveda*, a condition closely resembling childhood Iron Deficiency Anaemia is described as *Pandu*. It is classified under *Rasapradoshaja* and *Raktapradoshaja* Vyadhi and is primarily characterized by pallor of the skin, weakness, fatigue, loss of appetite, and reduced strength. Classical texts describe *Pandu* as a disease involving impaired nourishment of *Rasa* and *Rakta Dhatu*, which directly affects vitality and color of the body.[2]

The etiological factors of *Pandu* such as *Agnimandya*, *Alpa Ahara*, *Asatmya Ahara*, *Krimi*, and improper dietary habits show close similarity to modern causes of childhood Iron Deficiency Anaemia. Disturbed *Agni* leads to improper digestion and absorption, resulting in deficient formation of *Rasa Dhatu*, which further affects *Rakta Dhatu*. This sequential pathological process explains the development of anaemic features described in both systems.[3]

Understanding the correlation between *Pandu* and childhood Iron Deficiency Anaemia is important for developing an integrated approach to prevention and management. *Ayurvedic* principles focusing on correction of *Agni*, nourishment of *Rasa* and *Rakta Dhatu*, and use of *Rasayana* therapy offer a holistic perspective. A comparative understanding of both systems helps in early diagnosis, rational treatment planning, and better long-term outcomes in children.[4]

AIM AND OBJECTIVES

Aim

To study and correlate the concept of *Pandu* described in *Ayurveda* with Childhood Iron Deficiency Anaemia.

Objectives

1. To review classical *Ayurvedic* descriptions of *Pandu* with special reference to childhood.
2. To compare the *Nidana*, *Lakshana*, and *Samprapti* of *Pandu* with Childhood Iron Deficiency Anaemia.
3. To understand the relevance of *Ayurvedic* principles in the prevention and management of childhood anaemia.

Materials and Methods

This narrative review was carried out through a systematic study of classical *Ayurvedic* texts including *Charaka Samhita*, *Sushruta Samhita*, and *Ashtanga Hridaya* to collect references related to *Pandu*, its *Nidana*, *Lakshana*, *Samprapti*, and *Chikitsa*. Relevant modern medical literature on Childhood Iron Deficiency Anaemia was reviewed from standard pediatrics and hematology textbooks and peer-reviewed journals. Data were compiled, compared, and analyzed to establish conceptual and clinical correlations between *Pandu* and childhood Iron

Deficiency Anaemia, focusing on etiopathogenesis, clinical features, and therapeutic principles.

CONCPETUAL STUDY

Pandu

Pandu is a well-described disease entity in *Ayurveda* and is considered an important *Rasapradoshaja* as well as *Raktapradoshaja Vyadhi*. The term *Pandu* denotes a pale or whitish-yellow discoloration of the body, indicating deficiency and improper nourishment of *Rasa* and *Rakta Dhatu*. It is not merely a disorder of color but a systemic condition affecting strength, vitality, digestion, and overall growth, making it especially significant in children.[5]

Nirukti and Conceptual Meaning of *Pandu*

The word *Pandu* is derived from the Sanskrit root suggesting pallor or loss of natural body color. Classical texts describe *Pandu Varna* as a yellowish-white discoloration resembling pollen or clay. This altered complexion reflects internal *Dhatu Kshaya*, particularly of *Rakta Dhatu*, and indicates compromised life force or *Ojas*.[6]

Classification of *Pandu*

According to *Ayurvedic* classics, *Pandu* is classified based on *Dosha* predominance into *Vataja Pandu*, *Pittaja Pandu*, *Kaphaja Pandu*, *Sannipataja Pandu*, and *Mridbhakshana Janya Pandu*. Among these, *Pittaja Pandu* is considered most common due to the close relationship of *Pitta* with *Rakta Dhatu*. In children, *Pandu* often presents as a mixed *Dosha* condition due to immature *Agni* and developing *Dhatu*.[7]

Nidana of *Pandu*

The etiological factors of *Pandu* include faulty dietary habits such as *Alpa Ahara*, *Ruksha*, *Sheeta*, *Vidahi*, and *Asatmya Ahara*, along with excessive intake of incompatible or nutritionally deficient food. Lifestyle factors like *Ativyayama*, *Atinidra*, *Ratrijagarana*, and *Chinta* also play a role. In children, repeated infections, worm infestations (*Krimi*), poor appetite, and inadequate nourishment further aggravate the condition. All these factors ultimately lead to *Agnimandya*, which is the key initiating factor in the pathogenesis of *Pandu*.[8]

Samprapti* of *Pandu

Nidana Sevana (faulty diet, lifestyle, infections)
↓
Agnimandya (impaired digestive fire)
↓
Improper digestion and absorption of *Ahara*
↓
Formation of inferior quality *Rasa Dhatu*
↓
Vitiation of *Rasa*
↓
Inadequate nourishment of *Rakta Dhatu*
↓
Rakta Kshaya (depletion of blood tissue)
↓
Predominant vitiation of *Pitta* along with *Vata*
↓
Circulation of vitiated *Dosha* through *Rasavaha* and *Raktavaha Srotas*
↓
Srotodushti (obstruction and functional impairment)
↓
Manifestation of *Pandu Lakshana*
• *Pandu Varna* (pallor)
• *Daurbalya*
• *Shrama*
• *Klama*
• *Alpa Bala*
↓
In children:
• Rapid growth demand
• Poor *Dhatu Poshan*
↓
Early onset and faster progression of *Pandu*

Lakshana* of *Pandu

The cardinal feature of *Pandu* is *Pandu Varna* of the skin, eyes, nails, and mucous membranes. Other commonly described features include *Daurbalya*, *Shrama*, *Bhrama*, *Hridayaspandana*, *Shwasa*, *Aruchi*, and *Alpa Agni*. Children may present with lethargy, reduced activity, poor

academic performance, and delayed milestones. These manifestations closely resemble the clinical picture of Iron Deficiency Anaemia in modern medicine.[9]

Upadrava of *Pandu*

If left untreated, *Pandu* may progress to complications such as *Kamala*, *Shotha*, *Hridaya Roga*, and *Ojakshaya*. In children, chronic *Pandu* can impair physical growth, immunity, and mental development, leading to long-term health consequences.[10]

Sadhyasadhyata of *Pandu*

Early-stage *Pandu* with mild *Dosha Dushti* and preserved *Agni* is considered *Sadhya*. Chronic cases with severe *Dhatu Kshaya*, associated complications, or *Sannipataja* involvement are difficult to treat. Childhood *Pandu*, when detected early, generally has a good prognosis due to better tissue responsiveness.[11]

Chikitsa Siddhanta of *Pandu*

The management of *Pandu* is based on correction of *Agni*, elimination of vitiated *Dosha*, and nourishment of *Rasa* and *Rakta Dhatu*. *Deepana* and *Pachana* are advised initially, followed by *Raktavardhaka* and *Balya* therapies. *Rasayana* therapy plays an important role in children to restore strength, immunity, and growth. Emphasis is also placed on proper *Ahara*, hygiene, and prevention of *Krimi*.[12]

Importance of *Pandu* in Childhood

Childhood represents a phase of continuous growth and high nutritional demand. Any disturbance in *Agni* or *Dhatu Poshan* during this period easily leads to *Pandu*. Understanding *Pandu* in children provides a comprehensive framework to address nutritional anaemia holistically, focusing not only on supplementation but also on digestion, absorption, and tissue nourishment.[13]

Childhood Iron Deficiency Anaemia

Childhood Iron Deficiency Anaemia (IDA) is the most common nutritional deficiency disorder seen in infants, children, and adolescents worldwide. It occurs when the body has insufficient iron to meet its physiological needs, resulting in reduced hemoglobin synthesis and decreased oxygen-carrying capacity of blood. Children are especially vulnerable due to rapid

growth, increased iron requirements, and dependence on dietary intake for adequate iron supply.[14]

Epidemiology and Burden in Childhood

Iron Deficiency Anaemia accounts for a major proportion of anaemia cases in children, particularly in low- and middle-income countries. The prevalence is highest among infants, preschool children, and school-going children due to poor dietary practices, frequent infections, parasitic infestations, and socio-economic factors. Childhood anaemia remains a serious public health issue as it affects physical growth, immunity, school performance, and overall quality of life.[15]

Physiological Role of Iron in Children

Iron plays a critical role in hemoglobin formation, oxygen transport, cellular respiration, brain development, and immune function. During childhood, iron demand increases due to rapid tissue growth, expansion of blood volume, and neurocognitive development. When dietary intake or absorption is inadequate, body iron stores get depleted, leading to iron deficiency and eventually anaemia.[16]

Etiology of Childhood Iron Deficiency Anaemia

The causes of childhood IDA are multifactorial. Inadequate dietary intake of iron-rich foods is the most common cause, especially in children consuming cereal-based or low-protein diets. Poor absorption due to gastrointestinal disorders, recurrent diarrhea, and worm infestations further contribute to iron deficiency. Increased iron requirements during growth spurts and chronic blood loss due to parasitic infections also play a significant role. In infants, delayed or inadequate complementary feeding and exclusive milk-based diets are common contributing factors.[17]

Pathophysiology

Inadequate iron intake / poor absorption / increased requirement
↓
Depletion of body iron stores (↓ serum ferritin)
↓
Reduction in circulating serum iron
↓
Impaired hemoglobin synthesis

↓
Formation of microcytic and hypochromic red blood cells
↓
Decreased hemoglobin concentration
↓
Reduced oxygen-carrying capacity of blood
↓
Inadequate oxygen delivery to tissues
↓
Clinical manifestations such as fatigue, weakness, pallor, and reduced physical activity
↓
Impaired organ function
↓
In children:
• Affected physical growth
• Delayed brain development and cognitive function
• Reduced immunity and increased susceptibility to infections

Clinical Features

The clinical presentation of childhood Iron Deficiency Anaemia varies depending on severity and duration. Common features include pallor of skin and mucous membranes, fatigue, weakness, breathlessness on exertion, poor appetite, and irritability. Children may show reduced physical activity, poor concentration, learning difficulties, and delayed developmental milestones. In severe cases, tachycardia, systolic murmurs, and increased susceptibility to infections may be observed.[18]

Impact on Growth and Development

Iron deficiency during childhood has long-term consequences. It adversely affects cognitive development, behavior, attention span, and academic performance. Chronic anaemia can lead to growth retardation, impaired psychomotor development, and reduced immunity. Even after correction of hemoglobin levels, some neurodevelopmental deficits may persist if iron deficiency occurs during critical growth periods.[19]

Diagnosis

Diagnosis of Iron Deficiency Anaemia in children is based on clinical examination and laboratory investigations. Hemoglobin estimation reveals reduced levels, while peripheral blood smear shows microcytic hypochromic anaemia. Serum ferritin is the most reliable

indicator of iron stores and is typically reduced. Additional tests like serum iron, total iron-binding capacity, and transferrin saturation support the diagnosis.[20]

Prevention and Management

Prevention of childhood Iron Deficiency Anaemia focuses on adequate nutrition, iron supplementation programs, deworming, and health education. Dietary modification with inclusion of iron-rich foods and enhancers of iron absorption is essential. Early detection and timely intervention play a crucial role in preventing long-term complications and improving child health outcomes.[21]

Relevance in Comparative Studies

Childhood Iron Deficiency Anaemia provides a clear biomedical framework that closely parallels the classical description of *Pandu*. The emphasis on nutrition, digestion, absorption, and tissue nourishment creates a strong conceptual base for integrative understanding and management.[22]

RESULT AND FINDINGS

- A strong clinical resemblance was observed between *Pandu* and Childhood Iron Deficiency Anaemia with respect to pallor, weakness, fatigue, and reduced strength.
- Classical *Lakshana* of *Pandu* such as *Pandu Varna*, *Daurbalya*, *Shrama*, *Bhrama*, and *Aruchi* closely correlate with symptoms of iron deficiency in children.
- Etiological factors of *Pandu* including *Agnimandya*, *Alpa Ahara*, *Asatmya Ahara*, and *Krimi* were found to be comparable with poor dietary intake, malabsorption, and parasitic infestations causing childhood anaemia.
- The *Samprapti* of *Pandu* involving vitiation of *Rasa Dhatu* followed by *Rakta Kshaya* closely parallels depletion of iron stores and impaired hemoglobin synthesis.
- Involvement of *Pitta* along with *Vata* explains reduced formation and circulation of *Rakta*, similar to microcytic hypochromic anaemia in modern medicine.
- Childhood vulnerability to *Pandu* is well explained by *Bala Avastha*, rapid growth demands, and inadequate *Dhatu Poshan*.
- Both systems emphasize impaired nutrition and digestion as the primary initiating factors in the development of anaemia.

- The study supports that *Ayurvedic* concepts provide a comprehensive framework for understanding prevention and holistic management of childhood Iron Deficiency Anaemia.

DISCUSSION

The present review highlights a strong conceptual and clinical correlation between *Pandu* described in *Ayurveda* and Childhood Iron Deficiency Anaemia. The classical description of *Pandu* as a *Rasapradoshaja* and *Raktapradoshaja* Vyadhi explains the fundamental disturbance in nourishment and blood formation. Clinical features such as *Pandu Varna*, *Daurbalya*, *Shrama*, and *Aruchi* correspond closely with pallor, fatigue, weakness, and poor appetite seen in anaemic children. This similarity indicates that ancient *Ayurvedic* scholars had a clear understanding of the systemic nature of nutritional blood disorders.[23]

From a pathogenetic perspective, *Agnimandya* plays a central role in the development of *Pandu*. Impaired *Agni* leads to improper digestion and formation of inferior quality *Rasa Dhatu*, which fails to adequately nourish *Rakta Dhatu*, resulting in *Rakta Kshaya*. This sequence closely mirrors the modern concept of depleted iron stores, impaired hemoglobin synthesis, and microcytic hypochromic anaemia. The involvement of *Pitta* along with *Vata* further explains the defective formation, circulation, and functional efficiency of blood, providing a logical bridge between classical *Samprapti* and biomedical pathophysiology.[24]

Childhood represents a phase of rapid growth with increased nutritional requirements, making children particularly susceptible to *Pandu*. *Ayurveda* explains this vulnerability through *Bala Avastha*, immature *Agni*, and incomplete *Dhatu Poshan*. When combined with factors such as inadequate diet and recurrent infections, the disease progresses more rapidly in children. The discussion thus supports that *Ayurvedic* principles focusing on correction of *Agni*, nourishment of *Rasa* and *Rakta Dhatu*, and supportive *Rasayana* therapy offer a holistic and preventive approach for managing childhood Iron Deficiency Anaemia.[25]

CONCLUSION

The present narrative review concludes that a clear conceptual and clinical correlation exists between *Pandu* described in *Ayurveda* and Childhood Iron Deficiency Anaemia. The similarities in *Nidana*, *Lakshana*, and *Samprapti*, particularly the role of *Agnimandya*, impairment of *Rasa Dhatu*, and subsequent *Rakta Kshaya*, closely parallel the modern

understanding of iron depletion and reduced hemoglobin synthesis. Childhood susceptibility to this condition is well explained through *Bala Avastha*, rapid growth demands, and inadequate *Dhatu Poshan*. Understanding this correlation supports the relevance of *Ayurvedic* principles in early diagnosis, prevention, and holistic management of nutritional anaemia in children.

CONFLICT OF INTEREST -NIL

SOURCE OF SUPPORT -NONE

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