

**AYURVEDIC INTERPRETATION OF ERYTHROCYTE
SEDIMENTATION RATE: A CONCEPTUAL REVIEW****Vd. Anjali A. Shelke^{*1}, Dr. Ujwala V. Pawar²**

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ABSTRACT

Background: Erythrocyte sedimentation rate (ESR) is a simple, inexpensive, and widely used laboratory marker of inflammation in contemporary medicine. Although ESR is routinely used in the assessment of infectious, inflammatory, autoimmune, and systemic disorders, no direct description of this parameter is found in the classical Ayurvedic texts. This creates a need to interpret ESR through Ayurvedic principles to support integrative clinical understanding. **Aim and Objective:** To conceptually correlate ESR with Ayurvedic fundamentals such as Agni, Ama, Dosha, Guna, Mahabhuta, and Dhatu, and to explore its possible relevance in Ayurvedic diagnosis and management. **Materials and Methods:** A narrative conceptual review was carried out using classical Ayurvedic texts, modern pathology and hematology references, and relevant review literature on inflammatory biomarkers and ESR. The available

concepts were analyzed comparatively to identify possible Ayurvedic interpretations of ESR.

Discussion: Elevated ESR may be interpreted in Ayurveda as an indirect reflection of Agnimandya, Ama formation, Kapha predominance, and pathological involvement of Rasa and Rakta Dhatu. The plasma component contributing to ESR may be correlated with Rasa Dhatu, while the sedimenting erythrocytes may be correlated with Rakta Dhatu. Among the Gurvadi Gunas, Guru, Shita, Snigdha, Manda, Picchila, Sthira, and Sthula appear conceptually associated with increased ESR, whereas Laghu, Ushna, Ruksha, Tikshna, Vishada, Sara, and

Sukshma may be viewed as opposing factors. **Conclusion:** ESR can be understood as a non-specific but useful objective marker that may support Ayurvedic assessment of inflammatory and Ama-associated states. Its interpretation through Ayurvedic principles may help bridge modern laboratory findings with classical Ayurvedic clinical reasoning and may contribute to evidence-informed integrative practice.

KEYWORDS: ESR, inflammation, Ama, Agnimandya, Rasa Dhatu, Rakta Dhatu, Kapha, Ayurveda.

INTRODUCTION

Inflammation is a protective biological response of living tissues to injury, infection, or other harmful stimuli.^[1] In modern medicine, inflammatory biomarkers are used not only for diagnosis but also for prognostic evaluation and monitoring of treatment response. Among these biomarkers, erythrocyte sedimentation rate remains one of the most commonly used tests because of its simplicity, affordability, and broad clinical utility.

ESR measures the rate at which erythrocytes settle in a vertical column of anticoagulated blood over one hour and is expressed in mm/hour. Although ESR is a non-specific marker, it is widely used in the assessment of acute and chronic inflammatory conditions, infections, autoimmune diseases, tissue injury, anemia, and certain neoplastic disorders. The principal mechanism underlying elevation of ESR is enhanced rouleaux formation, which occurs when increased plasma proteins such as fibrinogen and globulins reduce the normal repulsive forces between erythrocytes.

In Ayurvedic clinical practice, patients with inflammatory or systemic disorders are often found to have elevated ESR values. However, ESR is not described as a direct laboratory entity in classical Ayurvedic texts. Therefore, its interpretation requires a conceptual translation through Ayurvedic principles such as Agni, Ama, Dosha-Dushya Sammurchana, Guna, and Dhatu. Such an interpretation may help create a meaningful interface between modern investigation and Ayurvedic pathophysiology.

The present review aims to provide a conceptual Ayurvedic interpretation of ESR and explore how this laboratory parameter may be understood within the framework of Ayurvedic diagnosis and management.

AIM

To conceptually interpret the Erythrocyte Sedimentation Rate (ESR) through Ayurvedic principles.

OBJECTIVES

1. To review the modern concept and mechanism of ESR.
2. To explore the relationship of ESR with Rasa Dhatu and Rakta Dhatu.
3. To analyze the role of Gurvadi Gunas in the conceptual interpretation of ESR.
4. To establish the clinical relevance of ESR in the Ayurvedic assessment of inflammatory and Ama-associated conditions.

MATERIALS AND METHODS

Relevant material was collected from classical Ayurvedic texts, including *Charaka Samhita*, *Ashtanga Hridaya*, along with standard commentaries. Modern medical textbooks related to pathology and inflammatory biomarkers were also consulted, as were scientific review articles discussing ESR, inflammation.

Review of Literature Erythrocyte Sedimentation Rate

ESR^[2] is the rate at which red blood cells settle under gravity in anticoagulated blood during one hour. It is influenced by several factors, including plasma protein composition, red blood cell concentration and morphology, plasma viscosity, specific gravity, and temperature.

The key determinant of ESR is rouleaux formation, in which red blood cells form coin-like aggregates and settle more rapidly. ESR generally increases in inflammatory, infectious, autoimmune, and neoplastic conditions, as well as in anemia.

The sedimentation process occurs in three phases

Phase	Time	Description
Aggregation phase	First 10 minutes	Rouleaux formation begins with slow settling.
Sedimentation phase	Next 40 minutes	Rapid and relatively constant descent of aggregated cells.
Packing phase	Last 10 minutes	Compact packing of erythrocytes at the bottom.

RESULTS

ESR and Guna

In Ayurveda, pathological change is understood through variations in Guna. Gurvadi guna referred to Sharir Gunas as they are associated with body and also related with substances

which influence body. Gurvadi Gunas are present in Prithvi, Vayu and Jala, etc. These considered important for therapeutic attributes and also applied in Samanya Vishesha Siddhant. Ayurveda described twenty Gurvadi guna in pairs of ten with opposite characteristics in each pair.^[3]

The Gurvadi Gunas of Rakta that may influence ESR are

❖ Certain qualities appear conceptually associated with raised ESR.

- **Guru:** Correlates with increased density, heaviness, and aggregation tendency, so it is conceptually linked with raised ESR.
- **Shita:** Correlates with coldness, sluggish circulation, and reduced dispersion, so it conceptually supports higher ESR when there is stagnation-like state.
- **Snigdha:** Correlates with unctuousness, stickiness, and cohesion, which resembles rouleaux formation and therefore raised ESR.
- **Manda:** Correlates with slow, dull, low-metabolic activity and poor clearance; this is conceptually associated with elevated ESR in ama-like or chronic sluggish states.
- **Picchila:** Correlates with slimy, sticky, adhesive quality, which conceptually favors cell aggregation and thus higher ESR.
- **Sthira:** Correlates with stability, fixation, and reduced movement, which can be viewed as promoting sedimentation and therefore raised ESR.
- **Sthula:** Correlates with bulk, coarse density, and heaviness, so it is also conceptually linked with increased ESR.

Gunas that may favor increased ESR

- Guru. Shita. Snigdha. Manda. Picchila. Sthira. Sthula.

These qualities promote cohesion, density, aggregation, and stagnation, which conceptually resemble increased plasma protein concentration and enhanced rouleaux formation.

❖ Qualities appear conceptually associated with lower ESR.

- **Laghu:** Light, reducing, and dispersing; conceptually linked with lower ESR because it opposes aggregation and bulk.
- **Ushna:** Hot and stimulating; conceptually linked with lower ESR because it promotes movement, digestion, and “clearing” of Ama-like stagnation.
- **Ruksha:** Dry and non-unctuous; conceptually linked with lower ESR because it reduces stickiness and cohesion.

- **Tikshna:** Sharp and penetrating; conceptually linked with lower ESR because it breaks up sluggish, congestive states.
- **Vishada:** Clear and non-slimy; conceptually linked with lower ESR because it opposes Picchila-like adhesion and turbidity.
- **Sara:** Mobile and flowing; conceptually linked with lower ESR because it supports circulation and prevents settling.
- **Sukshma:** Fine and subtle; conceptually linked with lower ESR because it opposes coarse, bulky, sediment-prone states.

Gunas that may oppose increased ESR

- Laghu. Ushna. Ruksha. Tikshna. Vishada. Sara. Sukshma.

These qualities may be viewed as opposing aggregation and stagnation.

Mahabhuta, Guna and Tridosha Relation

According to Ayurveda, the physiological and pathological state of the body is governed by the balance of the Panchamahabhutas (five great elements) and the Tridoshas (Vata, Pitta, and Kapha). Any imbalance in these principles leads to disease, which may be reflected indirectly by laboratory parameters such as ESR.

Vata Dosha is predominantly composed of Vayu and Akasha Mahabhutas.^[4] It possesses Ruksha (dry), Laghu (light), Sukshma (subtle), and Vishada (clear) qualities.^[5] Vata governs movement, circulation, and transport within the body. Vata alone has little direct effect on ESR, it facilitates the spread of pathological factors such as Ama and inflammation.

Pitta Dosha is dominated by the Agni Mahabhuta^[4] and is characterized by Ushna (hot), Tikshna (sharp), Laghu (light), Sara (flowing), and Drava (liquid) qualities.^[6] Pitta is responsible for metabolism, digestion, transformation, and inflammatory reactions. Aggravated Pitta produces Daha (burning), Teja (heat), and Pachana (transformation), which correlate with inflammatory processes that can result in an elevated ESR.

Kapha Dosha is composed of Prithvi and Jala (Aap) Mahabhutas.^[4] It possesses Guru (heavy), Snigdha (unctuous), Shita (cold), Manda (slow), Sandra (dense), and Sthira (stable) qualities.^[7] Kapha provides stability, nourishment, cohesion, and lubrication. Excess Kapha and Ama increase viscosity and aggregation within the body, resembling the increased rouleaux formation of red blood cells seen in inflammatory conditions, thereby contributing

to a raised ESR.

Correlation of ESR with Ama

Ashtanga Hridaya Sutrasthan 13, Ama is defined as-

"उष्मणोल्पबलत्वेन धानुमांद्यपाचितम्। दुष्टमाशयगत रसांआमां प्रिक्षते॥" अ.ह-सू.13/25

It represents that due to weak Agni the food can't be digested properly turning it into undigested unripe essence of food i.e. Apakwa Rasa.^[8] It becomes a toxic material circulating within body. Ama is not just a physical toxin but a pathological principle - a precursor.

The concept of Ama in Ayurveda and Erythrocyte Sedimentation Rate (ESR) in modern medicine both reflect pathological processes associated with inflammation, though they differ in their conceptual frame.

1. Etiological Factors

According to Ayurveda, Ama is generated as a result of Mandagni (impaired digestive and metabolic fire), which causes incomplete digestion and the accumulation of toxic metabolic by-products within the body.^[9] In modern medicine, an elevated erythrocyte sedimentation rate (ESR) occurs secondary to inflammatory conditions, mainly due to increased concentrations of acute-phase proteins, particularly fibrinogen.

2. Fundamental Characteristics

Ama possesses qualities such as Guru (heavy), Snigdha (unctuous), and Picchila (slimy), making it adhesive and capable of obstructing normal physiological pathways. In comparison, elevated ESR is characterized by increased aggregation of red blood cells resulting from changes in plasma protein composition.

3. Pathogenetic Mechanism

The accumulation of Ama causes Srotorodha (obstruction of body channels), thereby disturbing the normal movement of nutrients and physiological processes.^[10] Likewise, elevated ESR results from alterations in plasma proteins that promote rouleaux formation, leading to faster sedimentation of erythrocytes.

4. Clinical Manifestations

The presence of Ama is associated with symptoms such as fatigue, a sensation of heaviness, impaired digestion, and stiffness of joints. Similarly, diseases accompanied by elevated ESR

commonly present with clinical features including fever, malaise, anemia, and inflammatory joint involvement.

5. Diagnostic Importance

Ama is identified through a qualitative assessment based on clinical signs, symptoms, and Ayurvedic examination. Conversely, ESR is a quantitative laboratory parameter widely used for the detection, evaluation, and monitoring of inflammatory disorders.

6. Clinical Significance as a Marker

In Ayurveda, Ama is regarded as an early indicator of disease initiation and inflammatory pathology. In contrast, ESR functions as a nonspecific laboratory marker that reflects the presence and intensity of ongoing inflammation within the body.

Correlation with Rasa and Rakta Dhatu

The plasma fraction of the ESR column, containing fibrinogen and other plasma proteins, can be conceptually compared with Rasa Dhatu, as both are primarily responsible for nourishment and transport within the body. The Preenana Karma of Rasa Dhatu^[11] closely resembles the role of plasma in supplying nutrients and maintaining tissue homeostasis. Likewise, the sedimented erythrocytes may be correlated with Rakta Dhatu, whose Jeevana Karma^[1] is reflected in the oxygen-carrying function of red blood cells.

In Ayurveda, impairment of Agni results in the formation of Ama,^[12] which possesses Guru, Picchila, and Snigdha properties. These qualities, together with the predominance of Kapha Dosha, Now both aam.^[13] and kapha^[14] are guru in nature, increase the heaviness and viscosity of Rasa Dhatu. This conceptual increase in Guruta viewed as analogous to the increased plasma protein concentration observed during inflammation.

From the modern biomedical perspective, inflammatory mediators stimulate the synthesis of acute-phase proteins, particularly fibrinogen, which reduce the zeta potential between erythrocytes and promote rouleaux formation. When concentration of fibrinogen, alpha and beta globulin increases, ESR will be increased and vice-versa.^[15]

Thus, both Ayurvedic and modern concepts describe alterations in the body's internal milieu during inflammation. While Ayurveda explains this process through Mandagni, Ama, Kapha predominance, and increased Guruta of Rasa Dhatu, modern medicine attributes it to changes in plasma protein composition and erythrocyte aggregation.

DISCUSSION

The present review attempts to interpret ESR through Ayurvedic principles without claiming direct textual equivalence. ESR is a modern hematological parameter, whereas Ayurveda describes disease through functional and qualitative frameworks. Even so, meaningful conceptual bridges can be developed.

A raised ESR reflects a state in which the blood medium becomes more favorable to aggregation and sedimentation, primarily due to increased acute-phase proteins. In Ayurvedic thought, this may correspond to a state characterized by Agnimandya, Ama formation, Kapha predominance, and altered Rasa-Rakta Dhatu dynamics. The qualitative attributes involved in elevated ESR closely resemble the Guru, Snigdha, Picchila, and Manda properties of Ama and Kapha.

This interpretation is clinically relevant because it may help Ayurvedic practitioners integrate laboratory findings into classical assessment. For instance, in a patient presenting with signs suggestive of Ama, Srotorodha, Shotha, or chronic inflammatory pathology, an elevated ESR may serve as a supportive objective marker rather than an independent diagnostic endpoint.

CONCLUSION

ESR is a simple and valuable inflammatory marker in modern medicine, and it can be interpreted meaningfully within the Ayurvedic framework. Therefore, ESR may be considered an indirect objective marker that supports the Ayurvedic understanding of inflammatory and Ama-associated pathology.

This interpretation may help bridge modern laboratory assessment with Ayurvedic clinical reasoning and may guide integrative therapeutic approaches focused on Agnivardhana, Ama Pachana, and Kapha Shamana.

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