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## The Physiological Aspect Of Agni In Relation To Ayurvedic Biological Clock

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### ABSTRACT: -

Ayurveda is one of the oldest traditional heritages of our country, offering deep insights into health and longevity. It acts as a treasure trove of life's healthful wisdom, steering individuals towards the core goals of Ayurveda. The acharyas, or sages, through their careful observations, explore the depths of Ayurveda, sharing invaluable knowledge through their texts. In modern times, the idea of circadian rhythm, or biological clock, has garnered considerable interest, defined as the 24-hour cyclical changes that occur within our bodies and their clinical significance. Notably, this concept is also discussed in our ancient scriptures, which have not been given the acknowledgment they merit. These scriptures describe the cyclical nature of doshas, which vary over time and present different symptoms in the body. The acharyas have prescribed daily, nightly, and seasonal routines based on these doshas, which are vital for sustaining overall health throughout life, with each routine possessing its own clinical relevance. Establishing a daily regimen is essential for health, enabling necessary adjustments in body, mind, and spirit. A well-organized routine supports the balance of Tridoshas. Biological rhythms, including circadian, ultradian, and infradian rhythms, regulate bodily functions in a rhythmic fashion, governed by an internal clock. Each Dosha exhibits daily fluctuations influenced by digestion phases and age. Factors such as a person's age, circadian rhythm, and eating habits play a significant role in human physiology. Disruptions in the circadian rhythm, caused by environmental influences and bodily changes, can lead to various health problems known as circadian rhythm disorders. Agni, which signifies digestion and metabolism, can either foster health when properly managed or become harmful if ignored. Grasping the concept of Agni is crucial for maintaining optimal digestive and metabolic health. Both the physiological and pathological aspects of Agni are explored and highlighted. The importance of jataragni must be recognized, as it is responsible for the initial breakdown of complex food into simpler forms for the body to absorb. A disruption in this Agni can lead to the creation of ama, srotodushtilakshana, and various health complications. A thorough understanding of Agni's fundamental principles is essential for accurate diagnosis and effective treatment selection. Classical Ayurvedic texts detail a recommended daily routine, known as Dinacharya and Ritucharya, which outlines daily and seasonal practices for individuals to achieve optimal health and a balanced lifestyle. The principles of Ayurveda help us identify the most advantageous times for daily activities while keeping Doshic rhythms in an ideal state. To maintain health and prevent disorders related to modern lifestyles, it

is crucial to understand the circadian rhythm in Ayurveda, the factors that disrupt it, its pathogenesis, and the suggested strategies for resetting it.

**KEYWORDS:** - Ayurveda, circadian rhythm, Agni, Tridosha, biological clock.

## **INTRODUCTION: -**

Establishing a daily routine is crucial for maintaining health as it fosters essential changes in the body, mind, and spirit. A well-structured routine provides the framework necessary for individuals to balance the Tridoshas. Biological rhythms refer to the cyclic fluctuations within an organism, responding to periodic changes in the environment. These rhythms can be categorized into three types: circadian, ultradian, and infradian. To achieve optimal health, it is vital to live in harmony with nature, which is inherently dynamic, transitioning from day to night and through various seasons. Every living being adapts to these natural changes and follows routines that align with nature's rhythms to maintain health. However, modern work patterns and the pursuit of convenience have distanced us from nature, disrupting our routines and contributing to lifestyle-related disorders caused by stress and imbalances. Ayurveda is an ancient discipline rooted in the meticulous observations of sages. It primarily focuses on lifestyle practices to avert ailments and, secondarily, serves as a medicinal system. This aligns with the overarching aim of Ayurveda. A fundamental concept within Ayurveda is Lok-Purusha Samya, which posits that a living organism is a miniature reflection of the universe. This principle suggests that the external world's activities mirror the internal processes of the human body, as everything is composed of the five great elements, or Panchamahabhutas.

According to Ayurveda, variations in the body are influenced by factors such as dosha status, digestive fire (agni), physical strength (sharira bala), age (vaya), and seasonal changes. The sages have outlined practices like Dincharya, Ratricharya, Ritucharya, Sadvritta, and Achara Rasayan to prevent diseases and enhance longevity and health. In contemporary science, the physical, mental, and behavioral fluctuations in physiological processes are referred to as 'biological rhythms.' The term 'circadian' is derived from two Latin words: 'circa,' meaning approximately, and 'diem,' meaning day, collectively signifying a 24-hour cycle of physiological, behavioral, and molecular changes, along with various chemical processes occurring throughout the day and night. This biological clock is influenced by light and darkness, governing the sleep-wake cycle, temperature regulation, digestion, hormonal secretions, enzyme synthesis, and more, all regulated by a specific nucleus known as the suprachiasmatic nucleus in the hypothalamus. This nucleus acts as the master center for coordinating the rhythms of living beings. Melatonin, a hormone secreted by the pineal gland in response to darkness, plays a crucial role in maintaining this 24-hour internal clock.

Ayurveda is a comprehensive Indian medical system that aids the body in maintaining a stable internal environment by harmonizing the tridosha and agni. The human body functions like a robust machine, capable of operating continuously for years with appropriate care. The digestive system plays a crucial role in homeostasis by converting food into simpler substances that can be absorbed and utilized by the body's cells, while also removing waste. This system stretches from the mouth to the anus, creating a vast surface area that interacts with both the internal and external environments, and is intricately linked to the cardiovascular system. Classical texts highlight the significance of hrudaya as the foundation of rasa dhatu and vyanavayu, which are vital for circulation throughout the body. Metabolism encompasses the essential chemical processes that sustain life within the cells of living organisms. In every moment, dhatu experiences metabolic changes that affect our body's core temperature. Ayurveda emphasizes the significance of ushma in these transformations. To fully grasp digestion and metabolism, it is crucial to understand the concepts of jataragni, dhatwagni, and bhootagni as outlined in classical literature.

## MATERIAL AND METHODS: -

### Biological Rhythms: -

Biological rhythm refers to the cyclical fluctuations within an organism that occur in response to regular environmental changes. There are three main categories of biological rhythms: circadian rhythms, ultradian rhythms, and infradian rhythms.

### Circadian Rhythm: -

Circadian rhythm refers to the consistent cycle of physiological processes or activities that take place over a 24-hour period, also known as a diurnal rhythm. The term 'circadian' comes from the Latin words 'circa,' meaning 'around,' and 'diem,' meaning 'day,' thus signifying 'around the day.' This rhythmic variation arises in response to the alternating patterns of light and darkness that occur every 24 hours.

### Biological Rhythms as Per Ayurveda: -

In Ayurveda, the Ashtanga Hrudaya discusses circadian and ultradian rhythms through the shloka 'Vayo Ahoratribhuktanam te Antamadhyaadigaha Kramath.' This translates to the idea that the doshas—Vata, Pitta, and Kapha—are prominently present at different stages of life, throughout the day and night, and during digestion. Each dosha demonstrates variations that are influenced by the time of day, the phase of digestion, and the individual's age. When considering the Ahoratri, if we divide the day or night into three equal segments, Vata, Pitta, and Kapha will dominate the last, middle, and first segments, respectively. This cyclical variation of the doshas within a 24-hour period exemplifies the concept of circadian rhythm in Ayurveda.

### Ayurvedic clock: -

Acharya Vagbhat has described the variations of doshas in their normal states based on factors such as site, time of day, and digestive conditions. For instance, Vata dosha is located below the navel, is predominant during the aprahan kala (2 AM to 6 AM) and pratyusha kala (2 PM to 6 PM), and exerts a stronger influence towards the end of digestion and in the later stages of life. Pitta dosha is found between the navel and the heart, is dominant during madhyahna (10 AM to 2 PM) and ardharatri (10 PM to 2 AM), and has a significant impact during digestion and the adult stage of life. Kapha dosha is positioned above the heart, is dominant during poorvahna (6 AM to 10 AM) and pradosha kala (6 PM to 10 PM), and plays a crucial role at the onset of digestion and in childhood. He further noted that vata kopa (aggravation) and kapha chaya (accumulation) occur with tikshna agni (strong digestive fire) and pravara bala (strong digestive strength) in the shishir season, while kapha prakopa (aggravation) with madhyam agni and bala (medium digestive fire and strength) is observed in the vasanta season. In the greeshma season, vata chaya (accumulation) combined with pitta prakopa (aggravation) and kapha prasham (alleviation) occurs with manda agni (slow digestive fire) and avara bala (less strength). During the varsha season, vata prakopa (aggravation) and pitta chaya (accumulation) occur alongside tridosha kopa (aggravation) with manda agni and avara bala. In the sharad season, vata prasama (alleviation) and pitta prakopa are present with madhyam agni and bala, while in the hemant season, vata chaya and kapha chaya coexist with pitta prasham, supported by teekshna agni and pravara bala.

Acharya discussed the concept of ritu bhava within a single day, detailing the state of doshas at specific times associated with each ritu. For instance, during poorvahna (6am to 10am), there is an aggravation of kapha, suggesting that activities aligned with vasanta ritu should be undertaken. In madhyahna (10am to 2pm), pitta accumulation occurs, and practices from greeshma ritucharya are recommended. During aprahna (2pm to 6pm), vata aggravation is noted, indicating that pravrit ritucharya should be observed. In pradosha (6pm to 10pm), pitta accumulation is again present, and varsha ritu regimens are advised. In madhyaratri (10pm to 2am), pitta aggravation is observed, necessitating adherence to the regimens outlined

for sharad ritu. Finally, in pratyusha kala (2pm to 6pm), there is a pitta alleviation, suggesting that practices from hemanta should be followed. Various factors influence circadian rhythms, including dincharya, ritucharya, sadvritta, achara rasayan, and guidelines regarding diet and sleep, all of which are thoroughly detailed in Ayurvedic texts aimed at harmonizing the doshic rhythms within the body. Dincharya encompasses daily routines such as waking at brahma-muhurta, maintaining body cleanliness, applying collyrium and fragrances, and performing kshaur karma (nail and beard trimming) according to dosha timings to enhance longevity and health. The sun's rotation around its axis significantly contributes to diurnal variations, mirroring the doshic rhythms in the body.

Ritucharya refers to the six seasons in a year, each associated with different phases of doshas, including accumulation (sanchaya), aggravation (prakopa), and suppression (prashama). Based on these phases, ancient scholars prescribed specific dietary and lifestyle practices tailored to each season. Research has shown that failing to adapt to seasonal changes can disrupt the natural dosha cycle, leading to various health issues and mood fluctuations. Additionally, the sleep cycle is crucial for the optimal functioning of the body's biological clock. It significantly aids in memory consolidation, cellular repair, digestion, metabolism, nutrient absorption, and hormone regulation. The sleep-wake cycle serves as a restorative process, allowing the body to recover from daily cellular wear and tear, thereby ensuring that all organs align with their biological rhythms. During sleep, the central nervous system (CNS) plays a vital role in these restorative processes.

#### **Factors leading to disrupted or diminished circadian rhythms: -**

Include various environmental influences and physiological changes, which can result in a range of health issues known as circadian rhythm disorders. The primary causes of these disorders are identified as inadequate union (Heenayoga), distorted union (Mithyayoga), or excessive union (Atiyoga) of Kala (time), Artha (objects), and Karma (action). Kala signifies time, and its significance as an etiological factor is underscored by the fact that the impact of time is inherent and unavoidable. The cycles of day and night, the changing seasons, and the different phases of life all illustrate the multifaceted nature of time, which exerts diverse effects on the human body. Each Dosha experiences states of Chaya, Prakopa, and Prashama during specific seasons, which is a natural occurrence influenced by daily variations. Furthermore, all living beings undergo a continuous process of transformation.

The practices of Heenayoga, Mithyayoga, and Atiyoga related to Kala are unavoidable and can certainly result in health issues. Currently, even the balanced state of health in Samyogyoga of Kala is affected by factors such as stress, night shifts, and neglecting seasonal and daily routines. Irregular sleep patterns, improper meal timings, and poor food combinations disrupt the normal duration of digestion stages, contributing to health problems. Delayed Adharaneeya Vegas can lead to various complications. 'Artha' pertains to sensory objects, and the Heenayoga, Mithyayoga, and Atiyoga of sensory organs in relation to these objects are significant contributors to disease development. For instance, exposure to low-frequency sounds can strain the ears, while prolonged use of electronic devices at night and exposure to irritating sounds can lead to health conditions. 'Karma' refers to an individual's actions, and the Heenayoga, Mithyayoga, and Atiyoga of actions performed by the body, speech, and mind can also result in preventable diseases, a concept emphasized by Prajnaparadha. Therefore, the complications arising from Heenayoga, Mithyayoga, and Atiyoga concerning Kala, Artha, and Karma can disrupt the normal circadian rhythm, resulting in the Vyadhi condition.

#### **Rejuvenate Your Internal Biological Clock with Ayurveda: -**

The classical texts of Ayurveda provide a comprehensive guide to establishing a daily and seasonal routine that promotes optimal health and a balanced life. These principles help us identify the ideal times for daily activities while maintaining the balance of Doshic rhythms.

1) Dinacharya—Ayurveda outlines not only the importance of waking at Brahma Muhurth and dental hygiene practices but also includes other essential routines such as Danta Dhavana, Gandusha, Kavala, Vyayama, and Snana.

2) Ritucharya: Defining ritucharya from a global standpoint can be challenging due to the numerous variables associated with seasons, even within the same country. The descriptions of Ritucharya in our classical texts are tailored to the seasons in India and regions with similar geographical characteristics. However, it is important to note that the seasonal Doshic changes are consistent across the globe.

### **Agni: -**

The term 'alimentary' refers to nourishment. The alimentary canal, also known as the gastrointestinal (GI) tract, is a continuous passage that runs from the mouth to the anus, traversing the thoracic and abdominopelvic cavities. Accessory digestive organs include the teeth, tongue, salivary glands, liver, gallbladder, and pancreas. The secretions that enter the digestive canal via ducts facilitate the chemical breakdown of food. Acharya categorized all these elements under abhyantara rogamarga, focusing on the area of disease manifestation and guiding treatment selection. In Ayurveda, the division of kukshi is structured to ensure regulation of food intake quantity. Although space is divided, it is emphasized that the divisions are not equal; a larger portion is allocated for solid and liquid foods, while a space is reserved for the three humors. The doshas are located at various levels within the gastrointestinal tract, but collectively, they should occupy a minor space in their respective areas of action. Foods that are hard to digest should be consumed only until half-satiation, while easily digestible foods should be stopped before complete satisfaction. Prana vata plays a role in the processes of ingestion and propulsion up to ushmasthana.

Samanavata plays a crucial role in agniuttejana; without it, adequate heat cannot be sustained for the required duration. The significance of kala is emphasized in relation to food; if food is present for too short a time, transformation will not occur, while prolonged presence leads to stasis and shuktata. The water element, sneha, aids in softening complex food molecules for disintegration. Kledaka kapha in amashaya facilitates the conversion into chyme through bhinnasanghata. In avasthapaka, kaphadiudeerana ensures the proper formation of tridosha within the body. At each stage, the most complex substances are broken down into simpler forms. The primary focus should be on jataragni, as it is responsible for the initial breakdown of complex food substances into simpler components that can be assimilated by the body. Once this process is complete, dhatwagni and bhootagni take over their respective roles. This illustrates why dhatwagni is significantly influenced by kayagni. Each dhatu contains five bhootagni in varying proportions. Following the action of jataragni, it reaches each dhatu, where bhootagni takes the necessary prakrutamana (quantity) of each guna required for the growth and maintenance of that dhatu. Consequently, through gunaposhana, dravyaposhana occurs. The ashraja for agni is grahani, and they mutually influence one another. Therefore, grahanidushti can impact agni, leading to agnivaishamya, which results in the dushti of its adhishtanagrahani. The underlying cause of all roga is identified as mandagni and ama. In a broader context, ama refers to substances that are not being assimilated into body nutrients necessary for growth and repair. Thus, Acharya describes ama as anna rasa—the non-absorbed substrate, mala sanchaya—which fails to be expelled in a timely manner, and prathama dosha dusthi—the initial deviation from homeostasis.

In the initial phase of kriyakala, Acharya describes the dosha dushtilakshana at the kukshi level as the unhealthy food and lifestyle choices that lead to the formation of abnormal doshas in the koshta during avasthapaka. This can result in dosha-related diseases that an individual may experience in the future. From the prasara stage until the disturbed dosha settles in a dhatu or srotas due to kha vaigunya, it can lead to specific diseases where the associated signs and symptoms may exceed the limits of koshta. A knowledgeable Vaidya will recognize these issues in the early stages of kriya kaala—sanchayaprakopaprasara—and will provide treatment by observing the dosha dushtilakshana while considering the unique aspects of agnibala. Since agni is challenging to assess through pratyakshapramana,

as appetite and food intake are subjective, classical texts utilize anumanapramana for evaluation. Charaka, in Vimana Sthana, discusses the assessment of agni through abhyavahara nasakthi—the amount of food consumed—and jarana shakti—indicators of proper digestion such as absence of heaviness and abdominal distension, a sense of lightness, timely appetite, and regular waste elimination. The Vaidya should evaluate these characteristics of agni in each patient in both their prakruta and vikrutaavastha to create a scale ranging from avara to pravara.

In the context of Sara Pareeksha, a metaphor suggests that one should not judge an ant's strength by its size, as it can carry more than its own weight. Similarly, one cannot accurately evaluate the health of dhatu and agni based solely on external appearances. Currently, if fasting is practiced without assessing agni, it may lead to Ojakshaya and Vatavyadhi. The consistency and firmness of each dhatu, known as samhanana, varies. If the dhatwagni, or metabolic fire, is weak (manda), improper transformation can disrupt the samhanana of dhatu, leading to a condition called dhatu shaitilya, which manifests as functional disturbances in the body. When the consistency and firmness are compromised, it can result in an abnormal increase in dhatu due to the presence of saama. Srotodushti may arise from either excessive dhatu agni or weak dhatu agni. In cases of asthidhatwagnimandya, there can be excessive and abnormal bone growth, such as osteophytes and spur formations. Conversely, in cases of atyagni, there is increased bone mineral resorption and calcium loss through the kidneys, leading to reduced bone density, osteoporosis, and a higher risk of fractures. This phenomenon is also observed in the aging process, where there is a natural decline in agni, yet osteoporotic changes similar to those seen in atyagni are present. In aging, the pathogenesis is not due to atyagni; rather, there is a transition from osteoblast formation to a predominance of adipogenesis in the bone marrow, which has lipotoxic effects that impair matrix formation and mineralization.

## **DISCUSSION: -**

The circadian rhythm of Tridosha represents Shareera's adaptation to the cyclical patterns found in nature. As global warming leads to climate change, the infradian rhythms of Tridosha may begin to misalign with the shifting weather conditions. The ultradian rhythms of Tridosha possess a profound evolutionary background. Alterations in diet and sleep habits can disrupt these Doshic rhythms, potentially resulting in various diseases. The biological rhythms of Tridosha play a crucial role in regulating the physiological functions of Shareera. Gaining insight into these rhythms could enable us to reform public health strategies to lower the prevalence of non-communicable diseases (NCDs).

The references mentioned earlier indicate that the Tri-Doshas—Kapha, Pitta, and Vata—exhibit their dominance during specific times of the day and night, thereby influencing the body's circadian rhythm. The effects of these Doshas on physiological processes align closely with modern scientific concepts of the body's circadian clock. According to Ayurveda, the Kapha Prakopa Kala is associated with various symptoms such as weak digestion (Agnimandya), joint stiffness (Sandhi Asthi Vishlesha), breathlessness (Shvasa vridhhi), increased salivation (Praseka), body heaviness (Gaurav), drowsiness (Tandra), and sleep (Nidra). Similarly, modern science notes that in the morning, there is heightened salivary secretion, morning stiffness, and an increase in cold and cough symptoms, recommending a light breakfast, which corresponds with the Kapha symptoms outlined in Ayurveda. Furthermore, modern research indicates that nocturnal asthma attacks are prevalent during the early night hours, around 8-9 PM, which aligns with the Kapha Kala of early night, known as Pradosh Kala. Likewise, during midday, Pitta predominates, accompanied by symptoms such as intense digestion (Tikshanagni) and thirst (Kshudha Trishna).

Contemporary research suggests that consuming substantial meals during the hours of 12 noon to 1 PM can help manage the significant acid production that occurs during this time. Similarly, the period known as Ardhratri Kala, which spans from 10 PM to 2 AM, is characterized by heightened Pitta activity, aligning with modern scientific observations of increased metabolic processes during these hours, as Pitta is associated with metabolism. Furthermore, Vata Kala, according to Ayurveda, occurs between 2 PM and 6

PM (Aprahan) and from 2 AM to 6 AM (Pratyusha). Modern science indicates that the 2 PM to 6 PM window is a peak time for creativity, as individuals tend to exhibit heightened alertness and creativity. This period also sees an increase in peristaltic movements, which corresponds with Ayurvedic symptoms such as Anaha and Aatopa. Other Ayurvedic indicators of Vata Kala, including Alpa Bala, gatra sphurana, and nidranasha, also align with the observed rise in mental alertness during this timeframe. This raises the question of the underlying science of the circadian clock. Research shows that the circadian clock functions as a biochemical oscillator that relies on light to activate, regardless of the light source. Light serves as an input that resets the body's circadian clock, stimulating the oscillator and regulating physiological and behavioral rhythms.

The suprachiasmatic nucleus (SCN) located in the hypothalamus serves as the circadian pacemaker. As the environment shifts from light to darkness, the body transmits signals through the retinohypothalamic pineal pathway. During daylight, axons from retinal ganglion cells convey messages that activate the SCN via the optic nerve, cranial nerve II. In response, the SCN releases the inhibitory neurotransmitter GABA (gamma-amino-butyric acid), which suppresses the activity of the paraventricular nucleus. This inhibition extends through axons that transmit signals via the intermediate lateral column to the superior cervical ganglion, thereby dampening the sympathetic nervous system's activity. Consequently, melatonin is not released from the pineal gland into the bloodstream. As night falls, the absence of light prompts retinal ganglion cells to inhibit the SCN, which in turn activates the paraventricular nucleus. This nucleus sends axons through the intermediolateral nucleus (IML) to the superior cervical ganglion, stimulating the sympathetic nervous system and promoting sleepiness. The pineal gland is then triggered to release melatonin into the bloodstream.

## CONCLUSION: -

The biological cycles of Tridosha enable our adaptation to the environment. Ayurvedic literature has utilized this knowledge to create daily and seasonal routines that support the equilibrium of Tridosha in reaction to environmental changes. In this context, a balanced agni contributes to longevity, a healthy complexion, vitality, wellness, enthusiasm, radiance, and immunity. Therefore, agni is perceived as dual; when balanced, it sustains homeostasis, while its imbalance is considered the root cause of various ailments. Hence, it is essential to nourish and sustain Agni.

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