

Short title: Yoga and aging

## **Yoga and Aging: An Amalgamation of Ayurvedic and Contemporary perspectives**

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### **Abstract :**

Since the dawn of life, the human race has been extensively concerned for preserving youth, vigour, and vitality. With technological advancements, the factors accelerating aging have also advanced. To combat this, manifold measures have been proposed that retard aging and preserve the youthful bloom. The concept of healthy aging broadly involves a holistic, ubiquitous aspect involving both physiological and psychological components. In addition to decline of functional efficiency of individual cells, tissues, and organs, aging is characterized by a contemporaneous diminishment of the psycho-physiological functions. A few considerable underpinning factors behind aging involve physical, and psychological stressors along with the environmental ones. The process of aging is associated with the premature and excessive appearance of disease and dysfunctions that substantially ends to mortality. With progressing time, there is a significant regard in body functioning that can be demarcated by remarkable decline of physiological activities along with the psychological disturbances. These physical and mental disruptions may further result in deceasement of an individual. The immortal science of Ayurveda has a distinct branch for the study of aging, and geriatrics, including methods to defer it and promote the act of rejuvenation. The concept of aging that is influenced by various factors is included under the concept of 'jara' in Ayurveda. A better choice to restrain from the imminent decay is the practice of yoga for optimal health maintenance. It is one of the modest substitutes for enhancing health and longevity by preventing the early chronological degenerative changes. Thus, in order to delay aging, therapeutic intervention such as yoga can be put to practice.

**Key words:** Aging, Yoga, Ayurveda, longevity, health

## **INTRODUCTION:**

Aging can be defined as a demarcated, sequential physiological annihilation of bodily functions that subsequently lead to cessation of life. Ageing is a natural, unavoidable, and irreversible biological process characterized by a gradual decline in cellular and physiological function. This progressive reduction in vitality increases vulnerability to various diseases, diminishes the body's functional capacity, and ultimately contributes to mortality. Every individual is born with a certain group of specific cells that undergo growth, development, and reproduction over a due course of time. But owing to malicious lifestyle and exposure to malevolent environmental factors that lead to oxidative damage, along with general wear-and-tear, genetic instability, mitochondrial genome damage, and telomere shortening, the body cells get damaged that subsequently lead to aging. In addition to the physiological factors, psychological and socioeconomic stress factors play an essential role in promoting aging[1].

Aging can be broadly understood under two concepts –

- Physiological aging
  - Chronological aging.
- i) Physiological or Biological aging:

Physiological ageing is a gradual biological process characterized by time-related changes in cellular and molecular functions. These changes lead to progressive alterations in the structure and performance of tissues, organs, and body systems. As ageing advances, the body's capacity for maintenance, repair, and adaptation declines, increasing susceptibility to functional impairment and health-related challenges.

- ii) Chronological aging:

It is an outcome of time passage, and can be delayed up to a certain extent. Ageing is a multifactorial process, and no single mechanism can fully explain its occurrence. Numerous theories have been proposed, each highlighting different biological factors involved in age-related changes. At the cellular level, ageing is associated with decreased regenerative capacity due to reduced stem cell activity, accumulation of damaged proteins, increased presence of senescent cells that promote chronic inflammation, and declining mitochondrial efficiency. At the genetic level, progressive DNA damage, inadequate repair mechanisms, and shortening of telomeres contribute to the ageing process. Current evidence suggests that ageing results from the combined influence of multiple interconnected cellular and molecular mechanisms rather than a single causative factor[1,2].

## **MATERIALS AND METHODS:**

The present study included reviews on managing PCOD through lifestyle interventions from Brihatrayi and various articles, including any relevant commentary. While collecting

information from the above-mentioned materials, it is elucidated how lifestyle modifications can prove to mend PCOD.

### **AGE ACCELERATING FACTORS:**

- Genomic instability –

Genomic integrity plays a crucial role in preserving cellular function, longevity, and overall health. Modern lifestyle practices, including physical inactivity, exposure to environmental contaminants, and frequent consumption of highly processed, nutrient-poor foods, can negatively affect health and may accelerate age-related changes. These environmental and lifestyle influences contribute to genomic instability, while both internal metabolic processes and external physical agents can cause DNA damage. The accumulation of such damage over time is considered an important factor in the progression of ageing.

- Telomere attrition –

Maintaining telomere length accounts to genetic stability. For the same, telomerase activity is pivotal as it magnifies cellular longevity. Thus, appropriate functioning of telomere-telomerase mechanism is essential for maintaining cellular longevity and healthy aging[3].

- Cellular oxidative stress –

Oxidative stress is one of the prominent factors that adversely accelerates cellular aging. Sustaining the levels of cellular oxidative stress may promote better cellular viability. On the other hand, incoherence to the oxidative cellular levels may lead to degradation at the cellular level, thereby probing a thrust to aging.

- Inflammatory responses –

The cellular damage caused by oxidative stress is further evident through inflammatory responses of the body. This ill managed stress greatly accounts for escalated aging[4].

- Decreased neuroplasticity –

Neuroplasticity is central to neuropsychiatric conditions and their management. Higher levels of BDNF, sirtuin-1, and  $\beta$ -endorphin, along with reduced cortisol concentrations, have been associated with slowing cellular ageing in the brain. These changes may help protect against neurodegeneration, support neuronal survival, and enhance neuroplasticity, thereby promoting better cognitive health and brain function[5]. The thus increased neuroplasticity may alter the grey matter volume in different regions of the cerebral cortex of the brain that might result in augmentation of cellular longevity.

### **AYURVEDIC CORRESPONDENCE:**

Parallel to aging, the concept of 'jara' or 'vardhakya' has been described in Ayurveda. 'Shiryate Iti Shariram', the body naturally undergoes continuous degeneration[4]. Ageing is a

natural biological process experienced by all individuals as part of the passage of time. It involves gradual changes in the body's structure and function that occur throughout life. Being a physiological mechanism, it cannot be completely ceased but reducing the pace of aging may reduce the risk of disease occurrence that result because of age-kindred factors. Impaired bodily metabolism may lead to a decline in physiological functioning of the body that further hampers the overall functioning of the body, thus making an individual more susceptible to death. Complete arrest of the natural degenerative process of aging can not be altered but can be delayed or paced down to a slower rate in order to promote a longer, healthier, youthful, and disease-free living[6].

Jara is the natural process of gradual weathering of body. It is a group of degenerative changes that commence initially at the cellular level and later heads to destruction of the entire body. In the context of Swabhavoparamavada, Acharya Charak states that birth is naturally followed by death as a matter of cause and effect phenomenon[5]. Every entity passes through three stages of cycle – Utpatti, sthiti, and laya. Utpatti is the stage of origin, the beginning; sthiti is the near to equilibrium stage or the balanced state, while laya is the stage of destruction, where the body progresses to the ultimate state of death. The death that occurs because of the timely and gradual degradation of the body is called kalaja vriddhatva, that occurs as a result of time. Contrary to this, death or deterioration because of physical and psychological illness as an outcome of dosha-dhatu vaisamya prove to be a significant cause for Akalaja vriddhatva that subsequently head to Akalaja mrutyu[6].

Our body is an integral of the food we eat and the lifestyle we follow. Thus, Ahara and vihara equate the jatharagni whose imbalance may result in unforeseen health problems. Along with a healthy body, soundness of mind is inevitable for overall health maintenance. For the same, Sadvritta and Achara rasayana have been briefly described in the texts of Ayurveda. These conservative measures have been included under Dinacharya, and Rutucharya, whose obeyance may delay the process of natural aging. Nidra, one of the trayopastambha, also plays an important role in maintaining the state of wellness[7]. Poor sleep patterns can be debilitating as it hastens the process of aging.

Health is apparently a multidimensional aspect of promoting samatva between dosha, agni, dhatu, and mala that constitutes genomic stability and promotes longevity with health. Thus, for a multifaceted health aspect, an integrative approach such as yoga can prove to be benefitting when put to practice. Yoga is a holistic and mind-body medicine. It is more beneficial and advantageous than any individual physical interventions such as exercise, caloric restriction, and usage of antioxidants. Yoga is a congregation of certain specified physical postures, along with proportionate breathing patterns that control physiological and psychological activities. It positively impacts the cellular and molecular hallmarks of aging[8].

### **PROCRASTINATING AGING THROUGH YOGA:**

Practicing yoga can delay the natural process of aging through the following ways,

- Regular yoga practice has been shown to stimulate the activation of peroxisome proliferator-activated receptor-gamma coactivator 1-alpha (PGC-1 $\alpha$ ), a key regulator of cellular energy

production. Activation of PGC-1 $\alpha$  supports mitochondrial biogenesis and helps maintain efficient cellular energy metabolism, contributing to improved cellular function and vitality.

- Regular yoga practice may help reduce the levels of pro-inflammatory cytokines such as IL-1 $\beta$  and IL-18. One proposed mechanism involves increased methylation of the apoptosis-associated speck-like protein containing a caspase recruitment domain (ASC) gene, which can modulate inflammatory responses and contribute to improved cellular health.
- Enzymatic factors such as Mitochondrial transcription factor (TFAM), and Citrate synthase (CS) are poised through habituated practice of yoga.
- It enhances conversion of Pyruvate hydrogenase kinase isozyme (PDK4) to Acetyl CoA that leads to energy generation[9].

The skin is the largest organ in the body, and the aging effects reflect on it too. Decreased skin elasticity and dermal thickness because of deterioration of the dermis results in extracellular matrix degradation that bestow signs of aging on skin. Increased levels of inflammatory cytokines are also referred to as a cause for aging. Exercising in the form of yoga alters the increased level of cytokines, thus showing an anti-aging effect. Yoga should be individualized for conquering better intended results. The cardiovascular system is an essential body system responsible for maintaining life by ensuring the continuous circulation of blood, oxygen, nutrients, and other vital substances throughout the body. With progressing age, the system deteriorate with resulting ailments such as cardiac dysfunction because of cardiac stiffness and impaired myocardial relaxation, thus putting the body at risk. Practicing yoga enhances the metabolic profiles that improve the health and quality of life. Advancing age is associated with a gradual decline in cardiovascular efficiency and reduced elasticity of the lungs, which can contribute to increased oxidative stress and accelerate age-related physiological changes. Ageing of the skeletal system involves alterations in bone structure and remodeling, leading to decreased bone density and a higher risk of conditions such as osteoporosis, osteoarthritis, and fractures. Regular yoga practice may help counteract some of these changes by promoting balanced autonomic nervous system activity and improving the body's stress-response mechanisms. Yoga has been shown to support cardiovascular and respiratory health, enhance blood circulation and oxygen delivery to tissues, and contribute to psychological well-being by alleviating stress, anxiety, and depressive symptoms. These benefits collectively may improve overall health and quality of life during ageing[10].

Regular yoga practice promotes balance and harmony among the physical, mental, and emotional aspects of an individual, contributing to improved overall well-being and supporting healthy ageing and longevity. Physical activities such as yoga can bring about positive psychological attributes and a lower incidence of depressive changes that are significant with comorbid illness. Mindful practices of pranayama prevent the body from physiological and neuropsychiatric degeneration, thus maintaining the body-mind equilibrium.

## **CONCLUSION:**

Yoga is an evident, integrative lifestyle approach that attenuates aging. It significantly influences and promotes optimistic health and longevity. It imparts mosaic impacts on

cardiovascular, respiratory, skeletal, and psychological functioning of the body. Research evidences depict that intervening yoga as an integral part of our daily lives may influence the key drives of healthy aging that improve the quality of life. As there's no age to yoga, it should be intrigued at the earliest. It's better late than never.

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