

Impact of Pranayama on Biological aging – A review

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Abstract

Our biological age is decided by the presence of telomere at the end chromosomes. Telomere is a repetitive DNA sequence which present at the end of chromosome. And with every division of cells the length of telomere decreases. If the telomere gets too short then division of cells doesn't take place which lead to die of cells. With the shortness of telomere, the number of degenerative diseases increase. Telomere shortening. thus, change in lifestyle – including balanced diet, physical activity reduced the telomere shortening. Telomere at the end of chromosomes protect the DNA damage. But as the telomere get shorten the life span of person also get shorten. The shortening of telomere is natural, but it also depends on the others factors like lifestyles which we have adopted, environment, genetics and level of stress is also an important factor. Inflammation, oxidative stress may accelerate the telomere.

Yoga is an integrative system of mind, body and spirit. In yoga the main cause of all disease is stress. It is the most proper technique to adopt in lifestyle which create balance at every level like physical, mental and spiritual. The benefits of yoga also work at cells level and remove the dead cells and wastage out of the body, and negative thoughts from the mind. It rejuvenates the whole system and remove all toxicity. Pranayama is one of the limbs of yoga which plays an important role in maintaining harmony between physical and mental health. In pranayama practices we use large area of lungs for inhalation and exhalation. And during pranayama the oxygen level in the body increases, which lessen the inflammation in the body and also reduce stress level. Through which the degenerative process of telomere decreases or slowdown in natural way.

Keywords: pranayama, breathing exercise, biological aging, telomere length.

Introduction

The word Yoga is derived from the Sanskrit word 'yuj' which means to join. The joining of human consciousness to the cosmic consciousness. And it can be possible only through the practice of yoga. It is one of ancient practice through which we can bring harmony at the level of physical, mental and spiritual. **(Vanteddu, 2021)**. There is a belief that regular practice of yoga decreases the stress levels and improved antioxidant status through the establishment of harmony and functional balance between different organ system. Currently yoga is one of the popular practices for gaining the spiritual and overall well-being to worldwide. One of the oldest systems of world is yoga which now receiving attention for claim that it can contribute to healthy aging. Prana is the life force which works as catalyst in our lifetime activity and Ayama is the expansion of this force. And the sheath of this pranayama is pranamaya kosha. Pranayama is one of the fourth limb of yoga which came after Yama, niyama and Asana in Ashtanga yoga. It is the ancient breathing technique that originated from the yogic practices. It mainly involves the controlling of breath in different ratio and length. Pranayama means expanding the length and rising the prana at different level. It mainly consists of three phases Puraka (inhalation), Kumbhaka(retention), Rechaka(exhalation) **(Swiner, 2023)**. According to Hatha Pradipika when our nerve became purified by practicing pranayama then our body become lustrous, increase in gastric fire and our overall health became excellent **(Bhavanani, 2010)**. Proper controlling of breath extends our physical wellbeing which is a powerful tool against aging. It is the yogic science of using our breath for health of mind and body. Every cell in the body needs oxygen, in normal breathing we deprived of giving good amount of oxygen to the cells but during pranayama we provide full oxygen to all cells of body parts. When cells lacks of oxygen they went to irreversible damage and even death also. And this leads to accumulation of dead cells in the body which causes aging. **(Sharma, 2021)**. Breath act as bridge between the conscious and unconscious aspect of being. The burden of disability increasing due ageing population worldwide. That is why it is important to develop some intervention that will improve healthy aging and enhance the life quality. Yoga is mind- body intervention which is a combination of physical posture(asanas), breathing techniques (pranayama) and relaxation and meditation.

There has been a significant increase in complex lifestyle diseases in the last decades like depression, diabetes, cancer, infertility and all these are strongly associated with acceleration

of cellular aging. One of the causes of these disease is stress and additionally it causes the lowering the level of consciousness and quality of life and increase the rate of cellular aging. **(Nirodhi Namika Dasanayaka, 2023)**. Aging start as the replication of cells slow down. It is programmed process in each of the species like dogs, insects and human, all have their biological clock which determine its life at maximum and the rate of deteriorate of organs. Biological aging is the gradually accumulation of damage to the body's cells and tissue which also refers to the physiological aging. This led to decrease in physical and mental capacity of human being. And it increases the chance of getting diseases. The genetic makeup lies within the chromosomes which composed of DNA and proteins the and telomere which presents at the end of chromosomes plays an important role in aging. Telomere are the protective cap and protect the chromosomes from destroying as the cell division take place, and with every cell division the length of telomere decreases due to the effect of stress, environmental factor and other lifestyle factor. When the telomere became too short then the process of cell division does not take place and the cell became inactive or die. And this accumulation of dead cell became the reason for different types of diseases. **(Are Telomere the key to aging and Cancer, n.d.)** There are numbers of diseases which started due to aging process like osteoarthritis, heart diseases, diabetes, neurodegenerative diseases, metabolic diseases, immune system diseases. etc. **(Zhe Li, 2021)**. The process of aging accelerates due to our harmful and addictive behaviour and poor diet plan. Other reason for the aging is the ignorance of our health of the mind which causes stress and anxiety which further leads to cellular aging. **(Roberts, 2022)**. There are several factors which is responsible for aging: sleep, diet, physical activity, environment etc.

Factors for aging:

Poor Diet:

Intake of excessive amount of fatty, salty, sugary, high cholesterol and the processed food increases the chance of getting complications of heats, kidneys and other disorders. And these all are closely related to aging.

Inadequate exercise:

Inadequate exercise can increase the chance of getting obesity, diabetes, heart and lungs diseases and weaken the muscles and bones which eventually reduces the mobility. Whereas regular exercise creates the positive effects on aging, and it maintain strong immune systems and the cholesterol levels.

Insufficient sleep:

Our brain function became healthy when we have adequate sleep, and it also improve the immune system and overall mental health. Because inadequate sleep leads to severe metabolic diseases. **(Lifestyle factors and aging).**

Environmental factor:

When we expose to chronic DNA damaging agents like ultraviolet rays, oxidative stress and inflammation then it all leads to telomere loss. Also, prenatal tobacco exposure creates loss of telomere length. **(Z. Gunnur Dikamen, 2018).**

Biological factors:

Genetics – human genes are genetically programmed for aging. And this genetic theory of longevity is determined by the longevity of parents, as we are identical to them.

Metabolism and Oxidation – one of the crucial elements for aging is metabolism. Because it produces reactive chemicals which may increase the aging process through the damage of cells.

Wear and Tear – the cells of every part of the body gets damage due to wear and tear of it on regular basis. But when this damage became permanent then it impossible to repair and it cause aging. **(Panday, 2018).**

Dimensions of Aging:

Aging has been divided into four dimensions like **chronological aging** it means the number of years we live. Then **biological aging** it defined our cellular aging as how our body system work with period of time. Third is **psychological aging** it refers to the psychological changes occurs with the time. And the fourth one is **social aging** it shows the changes occur on the aspect of relationship with relative or on the workplace.

Benefits of Pranayama in different Hatha Yogic texts:

In Hatha yoga Pradipika it is given that by practicing pranayama our mind became steady and through pranayama all diseases eradicated and the impurities in nadis removed by it. It is said that Brahma also practice pranayama to get rid of fear and death. **(Hatha Yoga Pradipika II-2,16,37,39,47).**

Literature reviews:

1. this study has found that yoga and mind- body practices can be used as alternative technique to decrease the effect of premature aging, Alzheimer disease, cardiovascular disease. Yoga is the combination of physical posture, breathing practices and different types of meditation techniques which improves the overall physical and mental health. There is impact of yoga on neurodegenerative diseases which reverses memory loss, reduce depression and anxiety. **(Ashu Mohammad, 2018).**
2. The shortening of telomere length leads is associated with lifestyle disorders. There is study which show the positive effect of yoga other lifestyle-based intervention on cellular aging. In this result shows that there is effect of asana and pranayama to increase the oxygen level to the cells and meditation helps in reducing the stress level through the modulation of HPA axis. **(Rathore, 2018).**
3. This study was single case report with pre – post design to know the effect of yoga – based lifestyle intervention on oxidative stress and cellular aging in obese man. The intervention was included of Asana, pranayama (breathing exercise). And the result obtained was significantly positive, this practice causes the reversal of oxidative stress, marker of aging and DNA damaging. This practices not only delay the aging but also prevent from lifestyle related diseases. **(Shiv Basant Kumar, 2015).**
4. A study was conducted in Integral health clinic, new Delhi on 72 obese people. This study was done to know the effect of Yoga based lifestyle intervention on cellular aging. They were given Asana, Pranayama and meditation. The result obtained was significantly positive effect on telomere length **(Piush Sharma, 2022).**
5. In one of the study the intervention of yoga was given to 100 person who aged between 50- 65 years on the physiological and psychological parameters. They were given different types of asanas like Tadasana, Tiryaka Tadasana, Sashankasana, Savasana and pranayama was Kapalbhathi, Bhramari pranayama and Savita dhyana. Through this intervention researcher observed significant reduction in body weight, stress level and cholesterol. And it is the good sign of balance between physical and mental health, and this will automatically slow down the aging process **(Kumar, 2017).**
6. This study was single arm exploratory design of yoga and meditation-based lifestyle intervention which was given to 96 healthy individuals for 12 weeks. This intervention was consisting of different types of asanas like supine, prone, sitting and standing,

pranayama consists of Nadishodhana, Bhramari, Shitkari, Shitali and Brahmamudra. It also consists of meditation practice. to measure the cellular aging which include DNA damage marker, oxidative stress markers reactive oxygen species (ROS) and total antioxidant capacity (TAC). After this intervention the result was significantly change which influences cellular aging **(Madhuri Tolahunase, 2017)**.

7. A study was conducted to know the effect yoga on Leukocyte telomere length with oxidative stress. The age of samples lies between 30 – 40 years. And they were given asana, breathing exercise (pranayama) and meditation for 2 years. After 2 years of regular practice result, they found that there is lower level of oxidative stress when compared to control group. **(Bandi Hari Krishna, 2015)**.
8. This paper includes the 96 healthy individuals for the experiments and they were given yoga and meditation-based way of life meditation for 12 weeks. YMLI was included asana (physical stances), pranayama (breathing exercise) and meditation. This intervention was given to measure the cell maturing in healthy people. The result was also favourable and there was enhancement metabotropic biomarker and cardinal biomarker. **(Satish G. Sawarkar, 2018)**
9. This study was taken place on the patients with major depressive disorder. They were given 12 weeks of YMLI (yoga and meditation-based lifestyle intervention). They were divided in two group one was of YMLI and other was RDT (routine drug therapy). This YMLI was include set of asana, pranayama and meditation. The results obtained was both YMLI and RDT were similar at the base of intervention but after 12 week there was significant improvement in biomarker of biological aging in YMLI on cellular level when compared to RDT group. **(Madhuri R. Tolaunase, 2018)**.
10. It is a two – armed open label randomized controlled trial study in which the participants were of age between 60 – 75 years. They were given the yoga which included asana and pranayama for 12 months. The primary outcome which was observed was change in score of biological age predictors **(Vijaya Majumdar, 2023)**.
11. This study included 180 participants who are aging between 65 – 85 years. They were divided into two groups which was intervention group and wait – list group. This yoga intervention consists of hatha yoga in which asana, breathing exercise and meditation were given. it has a positive effect of on several health-related outcomes **(Josefine Osth, 2019)**.

Discussion:

This review paper highlights on the positive impact of yogic lifestyle like Asana, pranayama and meditation on promoting cellular aging and telomere length. It shows the improvement in telomere metabolism, balance of oxidative stress and genomic activity. So much exposure to environmental pollutants, sedentary lifestyle and taking processed and nutrition less food cause diseases in younger age. Due to depletion of telomere length and dead cells accumulation. Today modern lifestyle is associated with lots of psychological stress due to their bad habit and the environment they have created. All this leads to acceleration of cellular aging, which indirectly affect our physical, mental and reproductive fitness. If there is any imbalance in the regulatory system causes shortening of telomere, through slow, deep and smooth breathing which basically taken by diaphragm which increase the oxygen consumption and it decrease the production of release of ROS. The free radical minimizes through the practice of pranayama.

Conclusion:

Though we cannot stop our aging or can change biology, but definitely we can reverse or slow down our aging process which are taking place at fast pace. To get this we have focus on our whole lifestyle because cannot get it by changing only one aspect of life. Because aging is an integral process and it needs an integrated way to reverse it or slow down it. And yoga is one of the best practices which work on our whole system. It not only impacts our physical health but it creates positive change in physical, mental, spiritual and overall health. Making yoga as a part of lifestyle can be a key for delaying aging and it prevents from various lifestyle diseases and prolong the youthfulness. If we maintain our daily routine and keep eye on our diet, practicing asana, pranayama and meditation on daily basis. Then all this with combination form a balance life with happiness and harmony at all level. It not only enhances our life duration but it also increases our productivity at all level.

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