

## REVIEW ON PHYSIOLOGICAL ASPECTS OF JARA

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Article Received on 05/05/2020

Article Revised on 26/05/2020

Article Accepted on 16/06/2020

## ABSTRACT

Ageing is an inevitable process and this something everybody is well aware about. Across the board, it is the corporal beings' desire to remain young until the end. In the ancient era, people lived a long and healthy life because of their clean food habits and their disciplined lifestyle. Upanishads emphasize on the principle of living for a hundred years. Even in the *Ayurvedic* classics there is a reference about a branch- *Rasayana / Jara chikitsa* including various types of *Rasayanas* to check and prevent the process of natural degeneration and decay by maintaining the strength of the *Dhatus*. As the body of elderly people is expanding in the population, it is now necessary to develop novel strategies for Geriatric health care. *Ayurveda* has considered *Jara* (Ageing) and *Swabhavaja Vyadhi* (Natural disease) as natural and inexorable processes as, when old age sets in, homeostasis between the *Tridoshas* is disturbed. *Jara* is influenced by the factors affecting the *Shareera* (physical), *Indriya* (emotional), *Satwa* (psychic level), *Agni* (metabolism) and *Bala-ojas* (immunity). To ensure a long life free from senescence, our *Acharyas* adopted *Rasayana chikitsa* which is a promoter of longevity and health, preservative of youth, dispersive of somnolence, torpor, fatigue, exhaustion, indolence and weakness, restorative of the balance between *Vata*, *Pitta* and *Kapha*, curative of *Dhatu* imbalance, stimulative of the *Agni* (gastric fire) and promotive of lustre, complexion and voice. The physiological changes in *Jara* include loss of compactness of the muscles, looseness of joints, vitiation of *Rakta*, excessive production of *Medha*, failure of *Majja* accumulation in bone, reduction in the production of *Shukra* and loss of the *Oja* factor. Ageing represents structural and functional changes of an organism over its entire lifespan.

**KEYWORDS:** *Jara*, Ageing, Geriatrics, Old age, Elderly.

## INTRODUCTION

*Ayurveda* has described the concept of ageing as '*Jara*'. The word *Jara* has been derived from the root '*Jru*' which means decline stage or old age. '*Jara*' is defined as the phenomenon of becoming old by the act of wearing out. Its synonym '*Vardhakhya*' means increase of old age. The last stage of human life- '*Vridhawahastha*' corresponds to old age. According to Charaka, old age starts from 60 years while Sushruta considers it 70 years onwards. Therefore the ageing process after 60 years is *Kalaja jara*, while ageing occurring before 60 years of age is *Akalaja Jara*. *Sushrutacharya* has mentioned a group of natural diseases under the heading of *Svabhavalapravrutta Vyadhi* (natural diseases),<sup>[1]</sup> which includes *Jara*. They are of two types – *Kalaja* (mature) and *Akalaja jara* (premature). Out of these two types of ageing, *Akalaja jara* can be avoided by sufficient care of daily and seasonal regime or by the use of *Rasayana* but *Kalaja Jara* is incurable. However Chakrapani is of the opinion that though *Jara* is *Nishpratyayika* i.e it cannot be completely eliminated, *Rasayana* can delay ageing and also provide relief

against its symptoms. The term Geriatrics comes from the Greek word 'Geron' meaning 'healer'. Gerontology is the study of old age and the process of ageing. The branch of Geriatrics in medical science is meant for this and addresses health issues and works to prevent disabilities.<sup>[2]</sup> In *Ayurveda*, such an approach is explained in a branch called '*Rasayana*' which deals with much more than geriatrics. According to population census 2011 there are nearly 104 million elderly people in India. A report released by the United Nations Population Fund and the Help Age India suggests that the numbers of elderly people is expected to grow to 173 million by 2026.

**The process of Ageing**

From the moment of conception unto senescence, the human body undergoes considerable changes in shape, size and composition. *Acharya Charaka* when describing *Dhatupaka* encapsulated the continuous degenerative process occurring in the human body and irreversibility of this process.<sup>[3]</sup> *Acharya Vagbhata* and *Sharangadhara* emphasized the progressive deterioration of bodily

features decade wise, thereby setting milestones of ageing.<sup>[4]</sup>

**Table 1: Ageing in different span of life.**

Years	Vagbhata	Sharangadhara
1-10	<i>Balya</i> (childhood)	<i>Balya</i> (childhood)
11-20	<i>Vruddhi</i> (growth)	<i>Vruddhi</i> (growth)
21-30	<i>Prabha</i> (complexion)	<i>Chavi</i> (complexion)
31-40	<i>Medha</i> (intellect)	<i>Medha</i> (intellect)
41-50	<i>Twak</i> (skin)	<i>Twak</i> (skin)
51-60	<i>Shukra</i> (virility)	<i>Dristi</i> (vision)
61-70	<i>Akshi</i> (vision)	<i>Shukra</i> (virility)
71-80	<i>Sruti</i> (hearing)	<i>Vikrama</i> (courage/strength)
81-90	<i>Manas</i> (mental functions)	<i>Buddhi</i> (intellect)
91-100	<i>Sarvendriya</i> (all sensory and motor functions)	<i>Karmendriya</i> (motor functions)
101-110	-	<i>Cheta</i> (mental faculties)
111-120	-	<i>Jiva</i> (life)

### Theories on Jara

According to *Ayurveda* the theories that explain the process of ageing can be grouped as follows

**1. Swabhavaparamvada** (Theory of natural destruction)

It explains that there is no factor that can prevent ageing. The *Kshaya* of *Dosha*, *Dhatu*, *Mala* is *Ahetuka* which means it occurs very quickly, naturally or automatically without any external influences. Neither can it be provoked nor stopped.

**2. Eshwaravada** (God)

*Brahma*, *Prajapati* and *Indra* are represented in the body as respective elements. *Vayu* in *Vatakalakaliya Adhyaya* is said to be responsible for the formation, existence and destruction of life. According to Vagbhata, *Agni* is the prime factor for the existence of life and is termed as *Eshwara*.

**3. Kalavada** (Time factor)

*Kala* is the controller of birth, existence and death. *Jara* is divided as *Kalakruta* (timely) and *Akalakruta* (untimely).

**4. Yadruchhavada** (spontaneity, unexpected happening)

According to this theory everything happens just an accident or as an unpredictable event. Events happening spontaneously are mentioned as *Yadruchha*. Sudden change in the complexion of the body, death due to an unknown aetiology are a few examples of *Yadruchhavada*.

**5. Niyativada** (Rule, destiny, fate)

According to Charaka, *Daiva* (the acts of the previous life) are said to determine the *Ayu* of a person. *Adharma* is the cause for *Janapadodhvamsa* and it reduces the average lifespan of an individual. *Niyati* is said to be due to *Poorvajanmarjitha Dharma-Adharma* and it is mentioned as *Sarvasyakarana*.

**6. Parinamavada** (Transformation)

Everything is formed as a result of *Parinama*. *Acharya* Charaka states that the proper co-ordination of the six factors is essential for the *Parinama* (transformation) of food, resulting in *Dhatuamyas*, which is the basis for health, longevity, ageing and death. These are said to be

the *Parinama* of *Kala*. *Parinama* is one of the factors which cause diseases. It is due to *Parinama* that a foetus matures into an adult i.e. *Bala* turning to a *Vruddha*.

*Acharya* Sushruta while describing *Srushtiutpatti* enumerated the above discussed factors<sup>5</sup> as the cause of creation. The same can be taken as the cause for ageing.

**7. Tridosha and Ageing**

Among the *Tridosha*, *Vata* is the prime factor for ageing. As *Vata* increases, it reduces the lustre of skin, the body strength and enthusiasm. The second *Dosha* in the process of ageing is *Pitta*. It relates with *Jara* and *Jarana* and indicates the increased catabolic and degenerative process. In old age imbalanced *Pitta* leads to affected *Pachanakarma* (digestion), decreased *Buddhi*, *Medha*, *Roopagrahana* and *Prabhahani*. As *Vata* increases in old age, *Kapha* being inversely proportional decreases. The prime functions like binding mechanism and fluid supply. This causes laxity of joints and reduces strength.

**8. Agni and Ageing**

In old age aggravated *Vata* is responsible for *Vishamagni*, which affects the process of digestion. The state of fluctuating *Agni*, moving in between hyper (*Teekshnagni*) and hypofunctional state (*Mandagni*) is known as *Vishamagni*. As per modern researches, GI Motility decreases with age leading to constipation and gastro-intestinal distress, feeling of fullness and low appetite. Decreased gastric secretion, bile juice and pancreatic secretion inhibits fat and protein digestion and also there is decrease in glucose tolerance.<sup>[6]</sup>

**9. Dhatu and Ageing**

The strength of *Dhatu* decreases during old age. Due to *Vikrita Vata*, *Vishamagni* and *Ksheena Kapha* the *Adidhatu Rasa* is itself malformed and does not perform its function of *Preenana*. This leads to sequential weakening of the *Dhatuagnis*, further causing *Dhatukshaya*.<sup>[7]</sup> This is described by Sushruta as similar to "an old dilapidated house collapsing with the onset of rain."

**Table 2: Dhatu Ksheenalakshanas observed in Jara.**

Dhatu	Ksheenalakshana
1. Rasakshaya	<ul style="list-style-type: none"> <li>• Twakrukshata (dryness of the skin)</li> </ul>
2. Raktakshaya	<ul style="list-style-type: none"> <li>• Sira saithilya (laxity of blood vessels)</li> <li>• Rukshata (dryness)</li> </ul>
3. Mamsakshaya	<ul style="list-style-type: none"> <li>• Glani (weakness)</li> <li>• Ganda-Sphik Sushkata (loss of bulk of cheeks and buttocks)</li> <li>• Sandhi vedana (pain in joints)</li> </ul>
4. Medakshaya	<ul style="list-style-type: none"> <li>• Kati shunyata (numbness in hip)</li> <li>• Krushanagata (emaciation)</li> <li>• Sandhi shunyata (feeling of emptiness in the joints)</li> </ul>
5. Asthikshaya	<ul style="list-style-type: none"> <li>• Keshha(hair)-Loma(bodyhair)-Nakha(nail)-Shmashru(beard)-Danta(teeth) Patana(falling)</li> <li>• Sandhi sithilata (laxity in joints)</li> <li>• Asthitoda (pain in bones)</li> </ul>
6. Majjakshaya	<ul style="list-style-type: none"> <li>• Asthisoushrya (osteoporosis)</li> <li>• Brama (giddiness)</li> <li>• Timiradarshana (dimness of vision)</li> <li>• Vatavyadhi (neurological disorders)</li> </ul>
7. Shukrakshaya	<ul style="list-style-type: none"> <li>• Dourbalya (weakness)</li> <li>• Shrama (tiredness)</li> <li>• Klaibyata (impotency)</li> <li>• Vrushanatoda (testicular pain)</li> </ul>

Decreased absorption of nutrients like iron and calcium due to reduced secretion of hydrochloric acid and to aid in digestion. Absorption of Vit B<sub>12</sub> is reduced due to decreased intrinsic factor. Decreased levels of production of gastric HCl, intrinsic factor and digestive enzymes results in decrease in the primary building blocks needed for healing which are proteins, fats and complex carbohydrates. This dysfunctional state also affects the body's ability to absorb essential vitamins and minerals.<sup>[8]</sup>

Rasakshaya can be related to dehydration as a symptom due to decreased rennin activity and aldosterone secretion, relative renal resistance to vasopressin, changes in functional status, delirium and dementia, medication side effects and mobility disorders and dehydration risk increases because of the kidneys decreased ability to concentrate urine, altered thirst sensation.<sup>[9]</sup>

The Mamsakshaya can be compared with body composition changes as fat replaces muscle, in a process called sarcopenia in aged people. Research shows that exercise, particularly weight training, slows down this process. Because of the decrease in lean body mass, basal metabolic rate (BMR) declines about 5% per decade during adulthood.

Total caloric needs drop and lowered protein reserves slow the body's ability to respond to injury or surgery. Body water decreases along with decline in lean body mass. Atikshaya can be compared with the bone mass decrease due to ageing. Approximately 3-5% bone mass decreases for each decade beginning at the age of 40. Further leading to osteoporosis and increased chances of bone fractures.<sup>[10]</sup>

### 10. Ojas and Ageing

Ojas which is responsible for Vyadhikshamatva is decreased and causes different kinds of diseases, thereby leading to ageing. In old age due to Kshaya of Saptadhatus Oja Kshaya occurs.<sup>[11]</sup> The Oja Kshayalakshana observed in Jara avastha are: Sandhi vishlesha, Gatrasuda, Sramsas, Kriyasannirodha, Tandras, Mamsakshaya, Pralapa and can even cause Marana (death).

### 11. Mala and Ageing

Trividha Malas plays a vital role in the body dynamics as, elimination of Mala is an index of life activities. Impaired Agni in Jara leads to Malakshaya<sup>[12]</sup>. The Malaksheenalakshanas observed in old age are: Pureeshakshaya causing noisy movement of gas with the bowels producing colicky pain, oligurea, dysurea, falling of hair and cracking of skin.

### 12. Srotas and Ageing

According to Ayurveda various pathological conditions arise in the body due to Srotadusti of different Srotas.<sup>[13]</sup> The main function of Srotas is to transfer the body fluids. Among four kinds of Srotadusti, due to vitiation of Vata and Mandagni sanga is caused which leads to improper nourishment of body tissues in the aged.

### 13. Indriya and Ageing

The governing Vata and the nourishing Kapha are deranged in the old age leading to Indriya Dourbalya (weakness of sense organs). The researches show that the production of saliva is reduced and taste buds decrease in size and number. The changes in the taste buds start around 70 years of age. The ability to smell usually decreases. The diminished senses of smell and taste may decrease the pleasure of eating.<sup>[14]</sup>

#### 14. *Manas (Satwa) and Ageing*

*Manas* should be *Satwikapradhana* for it to gain the ability to sustain emotional assaults. Many of the *Manoviyadhis* develop due to *Alpasatwa* in *Jara* due to *Vikrita Vata* and depletion of the sustaining *Kapha* leading to *Manobhramsa, Pralapa, Bhaya, Shoka* and *Dainya*.<sup>[15]</sup> This can be correlated with dementia, delirium and depression with advancing age.

Having seen the *Ayurvedic* approach to ageing, we shall now look at the Allopathic point of view.

Ageing is defined as a progressive breakdown of homeostatic adaptive responses of the body. Ageing is a distinct environmental change. This process continues until oxidative phosphorylation is compromised, adenosine triphosphate (ATP) production declines and the cells begin to die.

Various theories have been put forward to explain ageing. The biological theories of ageing are

- Biological clock theory
- The Run out of program theory
- Gene theory
- Molecular theory
- Cellular theory

##### 1. **Biological Clock theory**

Every person has a 'Biological Clock' that starts ticking at the time of conception. Each individual has a genetic program specifying an unknown but predetermined number of cell divisions. Therefore, the person experiences changes such as atrophy of the thymus, menopause, skin changes and graying of the hair.<sup>[16]</sup>

##### 2. **The Run out of Program theory**

Every person has a limited amount of genetic material that will run out over time. After maturation, genes are activated and there are no more programs to be played and as cells age there may be a chance of activation of genes that cannot be turned on.

##### 3. **Gene theory**

The existence of one or more harmful genes that activate overtime resulting in the typical changes seen with ageing and limiting the life span of the individual. The gene which supports senescence and deterioration is activated leading to ageing.

##### 4. **Molecular theories**

Ageing is controlled by genetic materials that are encoded to predetermine both growth and decline.

###### ➤ **The error theory**

Errors in ribonucleic acid protein synthesis causes errors in cells resulting in the progressive decline in biological functions. Ageing is a result of internal or external assaults that damage cells or organs so they can no longer function properly.

###### ➤ **The somatic mutation theory**

This theory proposes that ageing results from deoxyribonucleic acid (DNA) damage caused by exposure to chemicals or radiation and this damage

causes chromosomal abnormalities that lead to disease or loss of function later in life.

#### 5. **Cellular theories**

This theory proposes that ageing is a process that occurs because of cell damage. When enough cells are damaged, overall functioning of the body is decreased.

##### ➤ **The Free Radical theory**

This theory of ageing states that organisms age because cells accumulate free radical damage over time due to which cells or organs stop functioning. Cells continuously produce free radicals by normal metabolism and oxidation of organic compounds and these free radicals damage cellular macromolecules like DNA, lipid, proteins and due to an accumulation of these there is ageing.

##### ➤ **The Cross Link theory**

Cell molecules from DNA and connective tissue interact with free radicals to form bonds that decrease the ability to replace itself. This results in the skin changes like dryness, wrinkles and loss of elasticity. Loosening of teeth, diminished elasticity of arterial walls and decreased efficiency of lungs and GI tract.<sup>[17]</sup>

##### ➤ **The Clinker theory**

This theory combines the Somatic mutation, free radical and cross link theories to suggest that chemicals produced by metabolism accumulate in normal cells and cause damage to body organs such as the muscles, heart and brain.

##### ➤ **The Wear and Tear theory**

As people age, their cells, tissues and organs are damaged by internal or external stresses. Health maintenance practices will reduce the rate of wear and tear, resulting in longer and better body function.

#### **System level theories**

##### ▪ **The Neuro endocrine theory**

The hypothalamus controls various chain-reactions to instruct other organs and glands to release their hormones. The hypothalamus also responds to the body hormone levels as a guide to the overall hormonal activity. As a person ages the secretion of many hormones declines and their effectiveness is also reduced due to the down grading of the receptors.

##### ▪ **Immunological theory**

This theory proposes that ageing is a function of changes in the immune system. The immune system weakens overtime, making an ageing person more susceptible to diseases.

##### ▪ **The Membrane theory**

As the cell membrane becomes older the lipid content decreases (less watery and more solid). This impedes its efficiency to conduct normal functions and there is a toxic accumulation. The cell's ability to transfer chemicals is an age related change as heat and electricity impair the cell membrane.

#### **DISCUSSION**

*Jara* is ineludible. Sushruta has mentioned it as a *Svabhavika Vyadhi*. As *Jara* creeps in, there are structural and functional changes at the cellular, tissue

and organ level. The biochemical composition of cells and tissues undergoes changes with age, the physiological capacity reduces and the ability to maintain homeostasis by adapting to various stresses declines. Hence the person becomes more vulnerable to diseases. For understanding the process of ageing in terms of *Ayurveda*, one needs the analysis of the physiological changes occurring at the level of *Tridosha*, *Saptadhatus*, *Malas*, *Ojas*, *Agni*, *Indriya* and *Srotas*. Here *Vata* is predominant, *Pitta* is irregular while *Kapha* is in the depleted state. This cascade of events targets the *Vyadhikshamatva* as well as *Satwa* of the aged, submerging him in diseases. The dependent *Dhatus* also undergo improper nourishment. This process is gradual and amounts to an irreversible process called ageing. The improper nourishment of *Rasa* and the other successive *Dhatus* leads to *Oja Hani* and *Shareera Apachaya* resulting in *Jara*.

### CONCLUSION

Old age is an undesirable and inevitable phase of human life. Though there is a disturbance in the equilibrium in all the *Tridoshas* during old age, quantity and quality of all the *Dhatus* decreases. The combination of dominant state of *Vata* and deterioration of *Rasadidhatu*, *Srotas* and *Agni* are responsible for the various degenerative changes and process of decay in the body. Hence *Jarachikitsa* warrants for management of *Agni*, *Ama* and *Oja* at the biological level. There is no single and complete concept on the ageing process. Different theories have been put forth in Allopathy and *Ayurveda*. Different physiological changes occur during different phases of life. These changes often lead to health problems and even death in the elderly. Physiology and pathology are both subtly interlinked and interspersed in geriatric problems making it difficult to draw a thin line between them.

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