

A Critical Review on Sleshaka Kapha of Ayurveda and its Affiliates in Physiological Perspective

MulaRam Suthar^{1,*}, Ritesh², Rakesh Roushan³

¹Department of Kriya Sharir, J. S. Ayurveda Mahavidyalaya, Nadiad, Gujarat, INDIA.

²Department of Kriya Sharir, National Institute of Ayurveda, (Ministry of Ayush, Govt. of India), Panchkula, Haryana, INDIA.

³Department of Kriya Sharir, Ch. Brahm Prakash Ayurved Charak Sasnthan, (Govt. of NCT Delhi), New Delhi, INDIA.

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ABSTRACT

Background: In Ayurveda, health signifies a equilibrium state where the body's physiological processes, encompassing Dosha, Dhatu, Mala and Agni, are balanced, alongside a state of overall well-being for the soul, senses and mind. The principles of tridoshas to explain human physiology, etiology of diseases, clinical sciences, etc. are emphasized. There are five subtypes of Kapha dosha: Bodhaka, Tarpaka, Avalambaka, Kledaka and Sleshaka. This Kapha dosha regulates body fluids and maintains the body constituents cohesive. **Materials and Methods:** Materials and methods include gathering and evaluating peer-reviewed and credible journal articles and Classical texts of Ayurveda that have met the set standards for this review through PRISMA. **Results and Conclusion:** The Sleshaka Kapha is situated in the joints. The liquid component of the secretion of the synovial membrane of the bony joint which lubricates for easy movements of joints can be represented as Sleshaka Kapha. The attributes of Kapha dosha are Guru (heavy) and Sandra (dense), Sita (cold), Mridu (soft), Snigdha (unctuous), Madhura (sweet), Sthira (immobile) and Picchila (slimy). The functions of Sleshaka Kapha can be compared with modern perspective. This article accomplishments to ascertain and establish the correlation between the physiological function of Sleshaka Kapha with concerning modern physiological perspectives. A literature search on primary data was conducted using ancient Ayurvedic texts and their commentaries, alongside textbooks from contemporary medical science.

Keywords: Ayurveda, Immunity, Kapha dosha, Joints, Kala, Ojas, Prakruta Karma, Sleshaka Kapha, Sleshmadhara Kala, Synovial fluid, Vyadhikshamitva.

Correspondence:
Assistant Professor.
Dr. MulaRam Suthar
Assistant Professor, P.G.
Department of Kriya
Sharir, J. S. Ayurveda
Mahavidyalaya,
Nadiad-391240, Gujarat,
INDIA.

Email: drmularam@gmail.com

INTRODUCTION

Ayurveda, an ancient holistic science, finds its foundation in the Tridosha Theory, which underpins all Ayurvedic principles. This science operates on a functional understanding, where the tridoshas operate at different levels of the system, including the cellular level, single-system level and organism level.^[1] Doshas are the fundamental principles of the body that are responsible for every physiological as well as pathological

event in the body.^[2] In a balanced physiological state, Kapha dosha promotes bodily lubrication, binds tissues, provides structural stability and firmness, maintains body mass, preserves sexual vitality, enhances physical strength and fosters superior mental faculties including intelligence.^[3] Sleshaka Kapha resides within the joints, specifically in the bony joints, facilitating lubrication and smooth joint movements. Synovial joints consist of fluid-filled cavities containing hyaline cartilage-lined bone ends enclosed in a tough fibrous capsule joining and surrounding the adjoining bony surfaces. The joint capsule is lined by a synovial membrane that secretes the synovial fluid.^[4] The Ayurveda bioscience and also concepts of Tridosha, Dhatu, Mala and Agni in Ayurveda are distinctly different from the modern perspective. It cannot be represented by a single entity. Ayurveda

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is a science that substantiates its principles through a functional perspective. No specific correlation of Sleshaka Kapha with contemporary modern physiology is mentioned in ancient texts. It appears to be a common challenge among first-year students pursuing a Bachelor of Ayurvedic Medicine and Surgery to grasp the concept of Sleshaka Kapha. Therefore, an endeavour has been undertaken to explore and establish an understanding of the physiological function of Sleshaka Kapha with concerning modern physiological perspective.

MATERIALS AND METHODS

The classical texts of Ayurveda, including Charak Samhita, Sushrut Samhita, Ashtang Sangrah and Ashtang Hridaya, were thoroughly examined for insights and comprehension of Sleshaka Kapha. These sources were collated, scrutinized and deliberated upon to gain a comprehensive understanding of the concept of Sleshaka Kapha.

Table 1: The Gunas (Property) of the Kapha Dosha and its Biological Effect.^[8]

Properties of the Kapha Dosha	Biological Effect
Guru (Heavy)	Produces heaviness (Gaurava), Increases excreta (Mala), Coats the body channels (Srotas Upalepa), Nourishes and increases mass, density.
Shita (Cold)	Styptic action (Sthambhana) and Produces pleasantness.
Snigdha (Unctuous)	Produces unctuousness and softness in the body, Lubricates elements.
Manda (Slow)	Responsible for slow and mild effectors delayed response.
Sthira (Stable)	Produces firmness and Stability.
Mridu (Soft)	Produces softness or fragility.
Pichchila (Slimy)	Produces stickiness or coating.
Slaksna (Smooth)	Produces soothing effect.
Sandra (Solid)	Produces compactness.

The Guna (Properties/Attribute) of Kapha Dosha

The Gunas (Properties) represent the physical and physiological qualities of Doshas. The Gunas are also embedded in each individual's constitutional (Prakriti) makeup. The Attributes show biological effects through the medium of a substance. The gunas of the Doshas have special clinical significance since the Vriddhi (increase) and Kshaya (decrease) of a particular dosha can be inferred from the symptoms of the increase or decrease of its gunas.^[5] All acharyas have described the Kapha is attributed with Guru (Heavy), Sheeta (Cold), Mridu (Soft), Snigdha (Unctuous), Madhur (Sweet),

Sthira (Stable) and Mrutsna (Sticky), Manda (Slow), Pichchila (Slimy), Sandra (Solid) and Slaksna (smooth) properties.^[6,7] Table 1 shows the gunas (properties) of the Kapha dosha and its biological effects.

The Karma (Function) of Kapha Dosha:

The Kapha dosha is to maintain the normal physiological function by fostering growth and anabolism. The Kapha dosha performs physiological, anatomical and psychological functions of the body. Table 2 shows the function of the Kapha dosha explained in different Ayurvedic commentaries. Table 3 shows the site and function of Sleshaka Kapha explained in different Ayurvedic texts.

Table 2: Function of the Kapha dosha explained in Different Ayurvedic Commentary.

Functions	Long Definition as per Ayurveda Commentary ^[9-11]	Correlation of Entities as per Modern Text
Sthira	Sthiratvam Dehmanaso and Sthiratvam Drudhangatvam.	Maintain the firmness and steadiness of the whole body also limbs. Maintain the stability of the concentration of the mind.
Snigdha	Snigdhatvam Dehasya.	Provides and maintains unctuousness to the body.
Sandhibandh	Sandhibandh ParvaSlishtta.	Maintains the anatomical integrity of various cells, tissue and organ with each other and provides support. Maintains the structural and functional integrity of all joints.
Kshama	Kshama Kshanti and Kshama Sahishnutvam.	Maintains the quality of forgiveness and forbearance.
Vrishata	Vrishata Streegamanashakta.	Maintains virility and reproductive ability.
Gauravata	Gauravam Prakrutam Shariragauravam.	Provides natural weight to various structures and body.
Dhi	Dhi Dnyana	Knowledge (Jnana)
Dhriti	Dhriti Mansoachanchlyam	Maintains the power of retention, understanding and Maintains the quality of patience.
Alobha	Alobha	Maintains the quality of greedlessness.
Bala	Balakruta Pustikruta.	Provides physical and mental strength and Maintains the Immunity (Vyadhikshamatava).
Ropana	Ropanakruta Vranasya Saumyatvat.	Helps in the healing process.
Purana	Puranakruta Sharirsya.	Provides nutrition to the whole body.

Table 3: Site and Function of Sleshaka Kapha Explained in Different Ayurvedic Texts.

	Asaya	Functions of Sleshaka Kapha
Charaka Samhita (Chakrapani) ^[12]	Located in the Parva (Joints)	Not Defined.
Sushruta Samhita ^[13]	Located in the Sandhi (Joints)	Sarvasandhisanshleshat, Sarvasandhianugraha (by virtue of its lubricating effects, maintains the structural and functional integrity of all joints).
Astanga Hridaya ^[14]	Located in the Sandhi (Joints)	Sandhisanshleshat (Maintains the integrity of all joints).
Astanga Samgraha ^[15]	Located in the Parva (Joints)	Sandhisanshleshat (Facilitating lubrication between bones in joints).

Function of sleshaka kapha

Sarvasandhisanshleshat, Sarvasandhianugraha

The classical Ayurvedic texts elucidate that Sandhi (Joint/Articulation) is the location where two or more bones of the body converge or unite. The Snigdha (Unctuousness), Sthira (Firmness/stability) and Sara (Mobility) properties of Kapha dosha in the body help in binding the bony joints and their easy movements.^[16] Normal synovial fluid seems colorless and clear due to the Accha (transparent) properties of Kapha dosha. Other appearances of synovial fluid may indicate various disease states.

Synovial fluid is very viscous (its high concentration of polymerized hyaluronate) due to the Sandra (viscosity) properties of Kapha dosha. Synovial fluid has the major component hyaluronan due to the Picchila, Mrutsana (sliminess) and Slakshna (smoothness) properties of Kapha dosha. The physiological functions of hyaluronan (lubrication) have been ascribed to the properties of these networks.^[17] The physiological effects of hyaluronan in synovial fluid are the maintenance of viscoelasticity, restoring rheological properties and metabolism of fibroblasts, shock-absorbing and joint-nourishing and maintenance of lubrication.^[18]

Sleshmadhara Kala

Kala is the inner lining / secreting membrane between the body's dhatus (tissues) and asayas (viscera).^[19] The types of kala described in ayurveda are mamsadhara, raktadhara, medodhara, sleshmadhara, purisadhara, pittadhara and sukradhara. The fourth one is called the Sleshmadhara kala (Synovial membrane); which is situated in all joints of the living beings. It refers to a specialized connective tissue that lines the inner secreting surface of synovial joint capsules and tendon

sheaths. Its primary function involves the secretion of synovial fluid, which serves as a lubricant for the joints.^[20] All types of Joints moistened by the sleshma (Synovial fluid) allow easy movements just as the wheels turn on a well-lubricated axle.

Modern Aspect

Normally, there is little free lubricating fluid in the joints, varying from less than 1ml to 4 ml in large joints. This synovial fluid is a clear or straw-colored, viscous, fluid containing hyaluronan, lubricin, proteinase, collagenases and prostaglandins.^[21] Lubricin is another secreted glycoprotein in the joints encoded by the plasticity-related gene. It also protects articulating surfaces and controls synovial cell growth. Synovial fluid comprises lubricin or Proteoglycan-4, which is a mucinous glycoprotein secreted by synovial fibroblasts. This substance serves as a significant lubricating element within the synovial fluid.^[22] Essentially, its role involves creating a lubricated boundary layer that minimizes friction between the opposing surfaces of cartilage. Additionally, there is evidence suggesting that it contributes to the regulation of synovial cell growth.^[23] The liquid component of the secretion of the synovial membrane of the bony joint which lubrication and easy movements of joints can be represented as Sleshaka Kapha. Table 4 shows the correlation of entities as per Ayurvedic text with modern physiology.

Table 4: Correlation of Entities as per Ayurvedic text with Modern physiology.

Entities as per Ayurvedic text	Correlation of Entities as per Modern Text
Sandhi ^[24]	Joint/ Articulation (the site of the junction or union of two or more bones of the body).
Asthi ^[25]	Bone (type of connective tissue which is hard and rigid)
Sleshaka Kapha ^[26]	One of the subtypes of Kapha situated in the joints (Provides lubrication to the joints).

DISCUSSION

Vata, Pitta and Kapha essentially form three regulatory systems within living organisms, corresponding to the nervous, endocrine and immune systems, respectively. According to Ayurveda, the immune system and all protective mechanisms within the body are classified under Kapha, with Ojas being closely associated with it. The Kapha dosha in a normal state is considered Oja by Acharya Charaka. Another name for normal Kapha is Bala (Strength to resist the disease). So, Bala and Ojas are equivalent terms. Three types of Bala have been described-Sahaja (Innate Immunity),

Kalaja (Acquired Immunity) and Yuktkrita (Artificial Immunity).^[27] According to Modern Medical Science classification of immunity has three types also the same (Ancient Ayurvedic Samhitas). The Vyadhikshamitva is another term for Bala given by Acharya Chakrapani. In Individuals, the absence of Ojas is considered as the Immuno-deficiency disorders category of immune disorders.^[28]

Among the five types of Kapha, Sleshaka Kapha is found in the joints and is essential for maintaining their structural and functional integrity. Vyana Vayu, a subtype of Vata, aids in bone movement and enhances mobility by coordinating muscle contraction and relaxation. Locomotion is considered a fundamental function of living organisms.^[29] The doshas operate through their gunas (properties), which are responsible for their specific functions (karma). Each dosha governs functions related to its properties, leading to particular outcomes. The Snigdha (unctuousness), Sthira (firmness/stability) and Sara (mobility) properties of Kapha dosha help bind the bony joints and facilitate smooth movements. Synovial fluid's primary component, hyaluronan, is attributed to the Picchila (sliminess), Mrutsana (smoothness) and Slakshna (smoothness) properties of Kapha dosha. The physiological role of Sleshaka Kapha is to absorb shock and reduce friction during joint movement.

The functions of Sleshaka Kapha can be compared with modern perspective. Synovial fluid, a thick, viscous solution found within the cavities of synovial joints, plays a crucial role in joint function. Synovial fluid in natural joints acts as both a lubricant and a medium for nutrient and cytokine exchange. It includes molecules that reduce friction and wear on articulating cartilage surfaces, ensuring smooth, pain-free movement in synovial joints. This fluid owes its lubricating properties to the presence of high molecular weight Hyaluronan (HA). The hyaluronan contributes significantly to the viscosity of the synovial fluid, ensuring it can effectively coat and protect the articular surfaces, reducing wear and tear on the cartilage. The combination of its viscosity and the unique molecular structure of hyaluronan allows synovial fluid to act as an efficient lubricant, maintaining joint health and function.^[30] From the above details, the functions attributed to Sleshaka Kapha by ancient scholars can be likened to the physiological roles of synovial fluid within the body's joints. The loss of articular cartilage and inflammation of the synovium leads to joint stiffness, swelling, pain and loss of mobility, causing several joint-related diseases. These diseases commonly affect weight-bearing joints, such as

the knee and hip and are therefore significant causes of disability.^[31] This article accomplishes to ascertain and establish the correlation between the physiological function of Sleshaka Kapha with concerning modern physiological perspectives. A literature search on primary data was conducted using ancient Ayurvedic texts and their commentaries alongside textbooks from contemporary medical science.

CONCLUSION

Kapha dosha governs the body's fluids and sustains the structural integrity of the micro-structures within living organisms. As one of the three doshas, it plays a crucial role in Ayurvedic physiology. Sleshaka Kapha is responsible for qualities such as cohesiveness, unctuousness, lubricity and stability. It performs physiological functions including imparting heaviness, coldness, tenderness, slowness, lubrication and serving as a carrier of nutrients. Sandhis are the points of connection or union between two or more bones within the body. The primary role of Sleshaka Kapha includes Sandhisanshleshat and Sandhianugraha functions. Sleshaka can be correlated with fluid in the joint synovial spaces, which helps in the nutrition of joints by helping new cells to form in place of worn-out and old cells of the joint capsule. The physiological effects of hyaluronan in synovial fluid are the maintenance of viscoelasticity, restoring rheological properties and metabolism of fibroblasts, shock-absorbing and joint-nourishing and maintenance of lubrication. There is a necessity for deeper scientific investigation into this significant traditional concept to comprehensively assess all aspects of Kapha dosha for the advancement of humanity. Analyzing muscles and joints in different musculoskeletal disorders using modern scientific methodologies could aid in grasping the normal and abnormal functionalities of Kapha.

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CONFLICT OF INTEREST

The authors declare that there is no conflict of interest.

SUMMARY

The Ayurveda bioscience and concepts of Tridosha, Dhātu, Mala and Agni in Ayurveda are distinctly different from the modern perspective. Hence an effort has been made to ascertain and establish the knowledge regarding the physiological function of Sleshaka Kapha with concerning modern physiological perspective. The physiological function of Sleshaka Kapha is to absorb shock and reduce friction during the movement of joints. From the above details, the functions of Sleshaka Kapha, described by Acharyas, can be compared with the physiological functions of synovial fluid in the joints of the body.

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