

**CURATING AND INTERPRETING THE LITERATURE RELATED TO KRIYA SHARIR-  
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**INTRODUCTION**

The acquisition of knowledge regarding the various domain of Sharira has been given utmost importance for the preservation of health as well as for the efficient management of diseases. Thus, the term Sharira Vichaya has been coined for the detailed and divided knowledge of human body (Ch.Sha. 6/3). Recently, it is studied under physioanatomical study of the human body i.e. Kriya Sharir (physiology) and Rachana Sharir (anatomy). The various aspects of Sharira are vividly discussed in Vrihatraye and Laghutraye. The description pertaining to Rachana Sharira is more organized as compared to Kriya Sharira as most of the anatomical description is available in Sharirasthana but the physiological description is distributed in different chapters and Sthana. All these description with their commentaries need to be collected and interpreted in a systematic manner for the enrichment of understanding on various topics of Kriya Sharir. Although many attempts have been done by the eminent scholars in form of textbooks, but certain topics such as Ksheera Dadhi Nyaya, Dosha Kshaya Vriddhi still need more embellishment by incorporating the views of commentators. Even though, few dissertation also have been carried out in different institution in attempt to collect the views of commentators on Kriya Sharir related areas but neither they cover all commentaries nor have been discussed in light of contemporary science. Thus, present study entitled "Curating and interpreting the literature related to Kriya Sharir available in various commentaries on classical Ayurveda compendia".

**MATERIAL AND METHODS**

Ayurveda compendia with their commentaries were thoroughly scanned by hand search method to collect the description pertaining to physiological aspect of Sharira. The collected data were arranged in form of different chapters. The meaning of various words were searched from Monnier Williams and Apte dictionary as well as NAMASTE (National AYUSH morbidity and standardized terminologies electronic) portal launched by Ministry of AYUSH. Further, these fundamentals were discussed with the existing knowledge as well as recent advancement in contemporary science for its relevance. For this incorporation was done from the standard books of physiology as well as from electronic database such as PubMed. The views of eminent scholars were included from their text books. E-Samhita designed and developed by National Institute of Indian Medical Heritage (NIIMH), Hyderabad was also used for shortlisting commentaries on certain words like Dhee, Dhriti, Smriti, Tushti, Pushti and Preenana etc. The Samhitas considered for the study are the Charak Samhita with Ayurveda Deepika and Jalpakalpataru commentary; Sushruta Samhita with Bhanumati and Nibandha Sangraha commentary; Ashtanga Sangraha with

Shashilekha commentary; Ashtanga Hridaya with Sarvanga Sundara and Ayurveda Rasayana commentary; Sharangadhara Samhita with Deepika and Gudartha Deepika commentary; Madhava Nidana with Madhukosha commentary; Yogaratnakara; Bhavaprakash; Bhela Samhita; Kashyapa Samhita and Harita Samhita. The other texts such as Amarkosha, Shabdakalpadruma etc. were excluded. The included topics were Dosha, Dhatu, Mala, Oja, Agni, Aahara Paka, Dhatu Poshana Nyaya, Srotas, Upadhatu while the description pertaining to the Mana, Aatma, Indriya and Nidra were excluded from the study. The assigned chapters and subchapters are:

1. Dosha: Vata Dosha, Pitta Dosha, Kapha Dosha, Dosha Kshaya Vriddhi and Prakriti
2. Agni, Aahara Paka, Dhatu Poshana Nyaya, Srotas
3. Dhatu: Rasa, Rakta, Mamsa, Meda, Asthi, Majja and Shukra.
4. Oja
5. Upadhatu: Stanya, Artava, Kandara, Sira, Vasa, Tvaka, Snayu
6. Mala: Dhatu Mala and Aahara Mala, Mutra, Purisha, Sveda

## REVIEW AND DISCUSSION

On reviewing the Samhita and their commentaries, it was observed that, the commentators have given their insights on the various topics of Kriya Sharir, incorporation of which will be helpful in better understanding of these topics. Some of the important explanations have been discussed as follows:

- **Dosha:** Dosha are the biological entities responsible for the execution as well as regulation of all sorts of activities in body. They have been termed as Dosha due to their ability to cause disturbance in homeostasis by affecting the other constituents of body on vitiation. But they have been also regarded as Dhatu and Mala too (Sha. Pu. 5/23-24). They are responsible for the maintenance of homeostasis by providing support to the body (Ch.Su. 9/4) by residing in lower, middle and upper parts of the body (Dalhana on Su.Su. 21/4). The scientific definition of Dosha has been mentioned by commentator of Madhava Nidana. He has mentioned that Dosha are the determining factor for the manifestation of Prakriti as well as ability to vitiate the other constituent of the body (Vijayarakshita on M.N. 1/ 14-15). The Dosha are mentioned in sequence of Vata, Pitta and Kapha but Sushruta has mentioned Kapha, Pitta and Vata sequence too to describe the "Urdhvamulam Adhoshakaha" feature of body (Su.Su. 21/4). Vagbhata has mentioned two types of Dosha i.e. Prakrita and Vaikrita Dosha (A.S.Sha. 8/6). The functioning of Tridosha can be understood from system biology at level of both cell as well as organism and neuro-immune and endocrine system of the body.

The various commentators have mentioned criteria regarding the consideration of sites of Dosha. Indu and Arundutta have mentioned the site of Dosha in accordance to functional dominance of Dosha while Chakrapani has mentioned it on clinical point of view i.e. prognosis, manifestation and management of diseases (Chakrapani on Ch.Su. 20/8; Indu on A.S.Su. 20/9; Arundutta on A.H.Su. 12/19).

The contribution of Acharya Kashyapa regarding the sites of Dosha is exclusive i.e. Hridaya and Bahu for Kapha Dosha while Asthi and Majja for Vata Dosha (Ka.Su.27/10-11). The criteria behind the consideration of specific sites of Vatadi Dosha can be well understood in view of contemporary science. For example, Pakvashaya has been considered as specific site of Vata Dosha due to action of gut microbiome in large intestine, Aamashaya as site of Pitta Dosha due to site of release of digestive juices and their action, Aamashaya as site of Kapha Dosha due to presence of mucus associated lymphoid tissue etc.

Apart from the criteria for the consideration for sites of Dosha, the commentator of Ashtanga Hridaya has mentioned the criteria for classification of Dosha i.e. Sthana, Karma, Avastha, Hetu, Aakriti, Sadhana and

Samayoga (Arundutta on A.H.Su.12/1). The properties of Vata, Pitta and Kapha have been vividly discussed to explain their expression in physiological as well pathological state. Acharya Charak has described different traits of Prakriti based on the attributes of Dosha (Ch.Vi.8/96-98), which is self-explanatory to show that Dosha exhibit their functions through Guna. The opinion of Hemadri, Sushruta and Bhavamishra (Hemadri on A.H.Su.1/18; Su.Su.45/515-522; Bh.Pu.6/202-211) can be concise to understand the physiological effects of these Guna in light of contemporary science, for example Sthula and Sukshma Guna as opening and closing of channels, Sheeta and Ushna Guna at level of temperature decreasing or increasing the excitability of nerve fibers, Ruksha Guna through physiological effects such as vascular resistance etc.

The functional status of Dosha varies physiologically as well as pathologically. The physiological variation in Dosha varies in accordance to day-night, meal time age (A.H.Su.1/7) while the pathological variation has been discussed through features of Kshaya and Vriddhi. The state of Kshaya can be assessed by observing the decreased functional or expressive status (Guna-Karma Hani) (Arundutta on A.H.Su.11/44), increased expression of opposite Guna or Karma (Chakrapani on Ch.Su.18/52) desire for the liking of food articles having similar qualities to the Ksheena Dosha. The state of Vriddhi will cause excessive expression of Guna and Karma (Arundutta on A.H.Su.11/44). These features of Kshaya Vriddhi can be assessed through the clinical conditions in which these are features manifested. The functional status of Dosha can be assessed through objective parameters designed on the basis of their prime functions (Verma V et al., 2018).

Prakriti has been mentioned as Sharira Svarupa (Arundutta on A.H.Su. 1/9) or Svabhava (Chakrapani on Ch.Vi. 8/97). It has been discussed extensively in all Samhita except Kashyapa Samhita and Madhava Nidana. The terms in context to Prakriti such as Utkatta, Anushayi, Sadatura etc. have been elaborated by the commentators (Chakrapani on Ch.Su. 7/40; Dalhana on Su.Sha. 4/63). The factors influencing the determination of Prakriti can be understood at level of epigenetic factors which cause changes in expression of genes without changing the sequence of protein in DNA (Sharma H and Keith Wallace R, 2020).

The various features of Vatadi Dosha are found to be concurrent with the findings of recent researches evaluating hematological, biochemical, physiological, genomic variations etc. (Tripathi PK et al., 2011; Purva MC et al., 2011; Ghodke Y et al., 2011; Mahalle NP et al., 2012; Rotti H et al., 2014; Rapulo SB et al., 2015; Aggarwal S et al., 2015; Mobeen F et al., 2019; Chaudhari D et al., 2019). Apart from these, commentaries are also available on the functions, types of Vatadi Dosha etc. Among these, the contribution

made by Acharya Bhela on Aalochaka Pitta is exclusive (Bh.S.Sha. 4/4-5). The consideration of Hridaya and Shira as a site of Sadhaka Pitta, Shadanga, Indriya, Prana etc. have been discussed. It has been opined that the anatomical description of Hridaya is reflecting the thoracic heart while the head should be taken as site of Sadhaka Pitta, Shadanga etc. The arrangement of Indriya etc. in manner of spokes of wheel in head might be denoting the ascending and descending tracts in brain.

- **Agni:** Apart from the four types of Agnibala, Gangadhara has mentioned three types of Agnibala i.e. Pravara, Madhyama and Avara Agnibala (Gangadhara on Ch.Su.5/4). Dalhana has categorized the Teekshnagni in to three types in accordance to severity (Dalhana on Su.Su. 35/24). Further the characteristics of different types of Agnibala have been discussed by various Acharya. Acharya Bhela has mentioned the quantity of Agni in accordance to body type (Bh.S.Sha. 4/16). Acharya Chakrapni has also mentioned that Agni is subjected to variation in accordance to age and season (Chakrapani on Ch.Su. 5/3). In recent past, many studies have been undertaken to show circadian rhythm and seasonal variation in digestion and metabolism (Koliada A et al, 2020; Yoneshiro T et al., 2016; Davenport ER et al, 2014; Bailey SM et al., 2014; Konturek PC et al., 2011).
- **Aaharapaka and Dhatuposhana:** The digestion in GIT has been mentioned under Avasthapaka and Vipaka. The Dosha produced at level of Avasthapaka have been mentioned as Malarupi by Acharya Gangadhara while Dhaturupi by Chakrapani (Ch.Chi. 15/9-11). Vipaka is the final transformation in Rasa Dhatu at the end of Jatharagni Paka (A.H.Su. 9/20) and can be taken as activities of brush border enzyme in intestinal villi (Guyton & Hall, 2018), as well as extra oral taste receptors (Gilca M, Dragos D, 2017). Further Bhutagni and Dhatvagni can be taken as intermediary and cellular metabolism respectively (Patwardhan K, 2005). The Dhatvagni can be understood from the cellular level enzymes as well as the hormones having effects in these tissues.

The simile of “Santataya Bhojya Dhatunama Parivrittiastu Chakravata” has been commented differently by Acharya Chakrapani and Arundutta (Ch.Chi. 15/21; A.H.Sha. 3/66). Further, it has been also mentioned that the previous Dhatu provides nourishment to next Dhatu but the reverse is also true (Ch. Chi. 15/19; A.H. Sha. 3/65). It can be taken as interdependence of Dhatu through the autocrine, paracrine and endocrine activities of cytokines released by them. Ksheera Dadhi Nyaya has been explained in detail by Chakrapani and Dalhana. Chakrapani has elaborated that the term Prasadaja in verse Rasadrakam Tato Mamsam..., it refers to formation of different tissues during intrauterine life which are nourished thereafter by the Aahara Rasa as

well as from previous Dhatu (Chakrapani commentary on Ch.Chi.15/16).

- **Srotas:** They are the transporting channels through which transportation of transforming nutrients take place (Ch.Vi. 5/3). They can be broadly taken as gross system of the body, receptors, ions, channels etc. These Srotas are not transport the transforming Dhatu but also transport sensory and motor impulses through Manovaha and Doshavaha Srotas. The Moola described for each Srotas has been explained as “Prabhava Sthana” (Chakrapani on Ch.Vi. 5/8) or “Upakaraapkaradvaram” (Indu on A.S.Sha. 6/25). In fact, these Srotas serve as site of onset of clinical manifestation in pathological condition of these Srotas. The four types of Srotodushti have been vividly discussed by Arundutta (Arundutta on A.H.Sha.3/46).
- **Dhatu:** These are the body constituents which perform Dharana (structural and functional support to the body) and Poshana Karma in body (nourishment to proceeding Dhatu as well as body). They have been also termed as Dushya as are affected by the vitiated Dosha (A.H.Su. 1/13).

Rasa Dhatu is the Teja, Drava, Sukshma and Sara Bhaga which provides nourishment to whole body differently in different phases of life (Dalhana on Su.Su. 14/3). Rasa Rakta Samvahana occurs ceaselessly, simultaneously to whole body (Ch.Chi. 15/36; Su.Su. 46/528). It is circulated in manner of Shabda, Archi and Jala (Su.Su. 14/16). This idiom can be understood at level of direction (Dalhana on Su.Su. 14/16), velocity and pressure of flow (Patwardhana K, 2005), Agnibala as well as rate of transformation (Chakrapani on Ch.Chi. 15/21; Dalhana on Su.Su. 14/16). The commentaries are available on the functions of Rasa Dhatu i.e. Tushti, Pushti and Preenana which reflect that these are referring to different forms of nourishment.

Rakta Dhatu is the red colored fluid formed from the Rasa Dhatu by the action of Raktagni in liver or spleen. Acharya Harita has given insightful description regarding the formation of Rakta by the action of Pittoushma on Rasa Dhatu in seven days through the various stage of changes in color (Chakrapani on Ch.Su. 28/4). The various characteristics of Rakta Dhatu can be understood from the characteristics of blood. Meda Dhatu is the Sneha distributed over abdomen and small joints (Su.Sha.4/12;A.S.Sha.5/33). It has been mentioned as of two types i.e. Baddha and Abaddha Meda (Ch.Ni. 4/7). The various functions of Meda Dhatu are concurrent with the findings of recent work on adipokines released by adipocytes.

Majja Dhatu is the Sneha filling the cavity of large bones (Su.Sha4/12; A.S.Sha.5/33). Now a days, bone marrow adipocytes have been identified as the organ playing a significant role in homeostasis of body. Its normal as

well as abnormal state also have influence over the eyes and it has been proved by recent researches that retinal cells possess receptors for adipokines. The description related to Shukra Dhatu is showing that it has been used for seminal fluid, male gametes, sex chromosomes in males as well as to the reproductive tissue and hormones of hypothalamo-pituitary-gonadal axis present in both male and female. It has been said to be present throughout the body, which can be said that the reproductive hormones exert effect on overall body physiology.

Oja is the biological entity which provides physical as well as psychological strength to the body. It has been mentioned as four types by Acharya Hemadri i.e. Rasatmaka Oja, Dhatutejarupi Oja, Jeevashonita Oja and Shukramala Rupi Oja (Hemadri on A.H.Su.11/37- 39). These description can be taken as various forms of immune cells in plasma, blood and tissue (Patwardhan K, 2005; Agrawal S et al; 2016). It has been said to be present in whole body but Acharya Bhela has mentioned twelve sites of Oja (Bh. S.Sha. 5/1) which can be taken as tissue specific immunities of these constituents. These description show that each tissue or organ in body have their own immune mechanism which provides defense against the invading pathogens. Acharya Sushruta has mentioned that Oja and Bala are the similar entities but Dalhana has mentioned that these two are different (Su.Su.15/19).

- **Upadhatu:** They can be considered as subsidiary Dhatu, which get nourished from the corresponding Dhatu. Aartava, Stanya, Kandara, Sira, Snayu, Vasa and Tvaka have been mentioned as Upadhatu as they bring about the Dharana function but do not cause the nourishment to the succeeding Upadhatu.

The different perspectives on lactation physiology and breast tissue in Ayurveda can be understood at level of role of hormones as such as oxytocin, prolactin, progesterone, estrogen etc. For example, milk ejection on sight or cry of baby might be representing the release of oxytocin hormone, the supply of nutrient to the breast tissue of mother during pregnancy might be showing the effect of estrogen and progesterone on breast tissue. The different description of Aartava show that, it has been used interchangeably for hormones of hypo-thalamo-pituitary-gonadal axis, ova, menstrual blood as well as female chromosome.

The different description of Aartava show that, it has been used interchangeably for hormones of hypothalamo-pituitary-gonadal axis, ova, menstrual blood as well as female chromosome.

The consideration of Sira under the Upadhatu of Rakta might be due to the fact that features of Rakta Kshaya and Vriddhi are reflected in Sira (Su.Su.15/9; Su.Su.15/16). The different description such as structure, attachment to heart etc. regarding Sira is showing that it

has been used for both arteries as well as for veins. So, it can be inferred that the interpretation should be taken in reference to context. The physiological effect of Vasa has not been described but it can be ascertained through the therapeutic indication in Snehana.

Tvaka has been mentioned to be present in all sensory and motor organs (Ch.Su.11/38) which can be well understood through their functions. Its simile with the banana leaves (Indu on A.S.Sha. 5/24) might be indicating the multiple layers of skin as well as the venation in leaves with the network of nerve, veins and capillaries over the skin.

- **Mala:** Acharya Charak has given broad perspective regarding the consideration of Mala and has mentioned anything afflicting pain in body as Mala (Ch.Sha. 6/17).

Acharya Sushruta has mentioned very scientific explanation regarding the urine formation (Su.Ni. 9/15-18). The description of Mutravaha Nadi emerging from Pakvashaya might be showing the relation between digestive and excretory system (Patwardhana K, 2005) while their branching and re-branching to become innumerable is showing that it might be referring to nephrons.

The different functions of Purisha can be understood through the action of gut microbiota in large intestine. The Dharana or vitality function of Purisha can be ascertained through the clinical condition such as malabsorption syndrome. Acharya Charak has also given the mechanism of sweating (Ch.Sha. 7/15) while Sushruta has mentioned regarding the sweat carrying vessels (Su. Sha. 9/9) and role of Vyana Vata in sweating (Su.Ni. 1/17-18). These description are might be showing the thermoregulatory mechanism of sweat.

The different perspective on hairs, nails, sebum etc. in contemporary science are showing the role of Dhatu Mala in homeostatic functions of the body.

## SUMMARY AND CONCLUSION

- The criteria for the consideration of sites of Dosha have been derived as per the description available in commentaries.
- The classification of Dosha has been vividly discussed by commentators.
- The understanding regarding the organs such as Kloma, Trika, Koshtha, and Grahani can be made by considering their anatomical location as well as functions.
- The subtypes of Vata, Pitta and Kapha Dosha have been discussed in light of contemporary physiology and possible interpretations have been made.
- The state of Kshaya, Vriddhi can be assessed by observing the exhibition of Karma, Guna and liking or disliking for certain substances or through certain objective parameters. The features mentioned in

state of Dosha Kshaya Vriddhi are indicator of various clinical conditions such as Pitta Kshaya possibly denotes hypothermia and hypothyroidism.

- The psychosomatic constitution or Prakriti can be ascertained through the findings of recent researches in terms of variation in genetic, biochemical, physiological and drug response, disease susceptibility etc. The factors influencing the determination of Prakriti can be taken as epigenetic. Vasa, Meda and Majja can be considered as the different fat depot in body.
- Vasa, Meda and Majja can be understood at level of adipocytes distributed in various parts of the body.
- Shukra Dhatu cannot be considered as controversial area, rather can be taken as reproductive tissue and hormones in both males and females.
- Oja is the factor responsible for the physical as well as psychological strength. It can be regarded as the tissue specific immunity in body. The causes and features of Oja Kshaya might be reflecting psychoneuroimmunology.

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