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Clinical significance of *Meda* and *Medovaha Srotas* in present scenario - A Comprehensive Study

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ABSTRACT

The explanation of *Sharir* in Ayurvedic texts states that the existence of *Dosha, Dhatu* and *Mala* together is *Sharir*. Basically, there are *Tridosha, Saptdhatu* and *Trimala*. *Meda* is one among the *Saptdhatu.* The internal transport system which is used to carry these *Dhatus* (Parinampradh) is *Srotas.* Vitiation and depletion of *Srotas* can lead to many pathological conditions in body. If *Medovaha Srotas* is vitiated it will cause *Medo Dushti* which may be expressed as either *Prameha Poorvaroopa* or the *Sthoulya Vyadhi*. And in present era they are compared with diabetes and obesity respectively. The epidemiology of obesity and diabetes is increasing day by day and having serious effect on our current as well as upcoming generations. Obesity has become a worldwide epidemic, and its prevalence has been projected to grow by 40% in the next decade. This increasing prevalence has implications for the risk of diabetes, cardiovascular diseases and also for chronic kidney diseases (CKD) – CKJ OXFORD. In 2017, about 72 million people and 20% of the urban population were diabetic in India - international diabetes federation (IDF). Health service use and medical cost associated with obesity, diabetes and related diseases have risen dramatically and are expected to continue to grow. The above mention data necessitates throw knowledge of the basic concept of the *Meda Dhatu, Medovaha Srotas*. Thus the present study deals with the understanding of *Meda Dhatu*, *Medovaha Srotas* along with its *Moola Sthana* and the disease that may occur from its vitiation. Similar concept from the contemporary science have been analysed for a better understanding.

Key words: *Ayurveda, Meda, Medovaha Srotas, Sthoulya, Prameha.*

INTRODUCTION

Ayurveda mentioned that "*Doshdhatumalamoolamhi Shariram"* i.e., the basic constituent of human body is *Tridosha (Vata, Pitta, Kapha), Saptdhatu (Rasa, Rakta, Mamsa, Meda, Asthi, Majja and Sukra)* and *Trimala (Sweda, Mutra and Purish).*[1] The term *Dhatu* is derived from Sanskrit root Du-Dhajya-Dharan Posanya i.e., support and nourishment. Out of *Saptdhatu, Medodhatu* which is the fourth is of more clinical importance now-a-days because it plays a significance role in developing many metabolic disorders like *Sthoulya, Prameha* etc.

Meda is present mainly in *Udar* but when it is present inside *Anuasthi* it is called *Sarakta Meda* and when in sthoola *Asthi* the same is called *Majja*.[2] The pure form of *Meda* present in *Mamsa* (Peshi) is called *Vasa.* Thus, all form of lipids in body is present mainly in *Meda Dhatu.* The transporting system to carry the *Parinampradh Meda* dhatu from the site of production to the site of action is *Medovaha Srotas* i.e., the channels through which the *Poshak Dhatu* passes to form the *Sthayi Dhatu*.

In order to maintain the state of health it is necessary to have normalcy at level of *Dosha, Agni, Dhatu, Mala* along with *Prasanna Indriya* and *Manaha*.[3] When there is *Vikruti* in any of the *Dhatus*, whether it is

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Pramantaha or *Guntaha*, then it surely effect both the body and the mind. According to the definition of *Swasthya* (health) it is important to have normalcy at the level of *Dhatu*. By the term *Dhatu*, here we considered both *Meda* and *Medovaha Srotas* because *Meda Dhatu* formation alone can't perform any function without proper circulatory system i.e., *Medovaha Srotas*.

Thus, clearance and obstruction of the *Srotas* is the condition of health and disease accordingly. Hence, in the maintenance of health the importance of *Srotas* is very obvious.[4] The disturbance in *Medodhatu* and *Medavaha Srotas* is very common in present era because of increase craving towards fast food. About 80% of the food on the shelves of supermarket today didn't exist 100 year ago – Larry Mc Caleary MD

Aim and Objectives

- To study the concept of *Meda Dhatu* and *Medovaha Srotas* through *Samhita Granths*.
- To study scientific corelation of *Medovaha Srotomoola* with that of contemporary science concept.
- To study classical concept of *Medoroga* and *Medovaha Sroto Dushti Lakshana* with that of modern allopathic science concept (contemporary science).

Material and Methods

It is a conceptutal study. The material is collected from the classical Ayurvedic texts, modern literature and various research papers etc.

Review of Literature

Meda Dhatu

The word *Meda* is derived from root *'Jihimida Snehana'* i.e., substance which is having the *Snigdhatva* property like- Sneha, fat, oil etc. *Medyati Snihatiiti Meda – Shabdkalpadruma*. *Meda Dhatu* is formed from the *Mamsa Dhatu* by the action of *Mamsagni* along with *Updhatu*.[5] It is composed by relative predominance of *Jala* and *Prithvi Mahabhoota*.[6] It is Derivative of *Matraj Bhava*. The *Meda* which is Present inside small bone is called as *Sarakta Meda* and when it is present inside the long bone is called *Majja*.[7]

There are two type of *Medo Dhatu – Poshak* (nourishing) and *Poshya* (which get nourishment). Among these two *Poshak Medodhatu* is mobile in nature, which circulates in the whole body along with *Rasa, Rakta Dhatu* to give nutrition to *Poshya Medodhatu*. The *Poshya Medodhatu* which is immobile in nature is stored in *Medodhara Kala*. The site of *Medodhara Kala* is *Udar* and *Anuasthi.*[8] *Udar, Sphik, Sthan* are also depot of *Poshya Medadhatu*. *Meda dhatu* is the predominant *Dushya* in most of the *Santarpanjanya Vyadhi* like *Prameha* and *Sthaulya*.[9]

The channels which give nutrition to the *Medo Dhatu* or the vessels carrying the nutritive material up to the site of *Medodhatu* can be considered as *Medovaha Srotas*

Function of *Medodhatu*

- *Charaka Samhita - Asthi Pushti*
- *Sushruta Samhita - Sneha, Sweda, Dradhatva* and *Asthi Pushti*
- *Astanga Samgraha - Sneha, Sweda, Dradhatva, Asthi Pushti, Netra and Gatra Snigdhata*
- *Bhavprakash - Sneha*
- *Astanga Hridaya - Sneha*

Srotas

The internal transport system of body is represented as *Srotas*. It has been given a place of fundamental importance in *Ayurveda* both in health and disease condition. The term *Srotas* is etymologically derived from the Sanskrit root *'sru sravane'* i.e., to move, to flow, to permeate, to ooze, to filter, to exude, to secret, to leak. According to *Acharya Charaka, Strotas* is defined as the channel or structure through which *Sravanam* i.e., oozing, moving and permeation of different constituents and nutrients takes place.[10] Again, it is described as channels of circulation that transport the *Dhatus* which are constantly subjected to metabolic transformation (*Parinamamapdyamananam*).[11] They work as

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communicating channels for nutrient tissues (*Asthayi Dhatus*) which are to be utilized for formation of permanent *Dhatus* (*Sthayi Dhatus*).

Acharya Sushruta describes that *Srotas* are the channels of the body having originated from organ cavity i.e., *Khadantarm* spread throughout the body excluding *Sira* and *Dhamani*.[12]

Acharya Vagbhat compared *Srotas* to the extremely fine passages and pores present in the lotus stem. He observes, "Rasa spreads throughout the body through very fine dwaras (pores) of Srotamsi which are distributed extensively in the body, very much like minute channels, present in the lotus stem." [13]

According to *Chakrapanidatta Srotas* are the channel which serves as vehicles of transport of both *Prasad* and *Mala Dhatus* and also serve as the place of their entry (or exit).

Dalhana the commentator of *Sushruta Samhita* has described that all the structures through which *Prana, Anna, Udaka, Rasa, Rakta, Mansa, Meda* etc. circulate are called Srotas.

In short according to contemporary science we can consider Srotasas as the micro and macro channels of circulations and pathways, carrying out all the physiological functions of the body. They carry solid, liquid and gaseous type of substances, nerve impulses, nutrients, secretions, enzymes, hormones, waste product etc. in and out of the system.

The healthy and diseased condition of the body depends on proper structure and function of these macro and micro channels. As long as these channels of circulations perform their normal functions, the body is void of diseases.[14]

Swaroopa (characteristics and qualities) of *Srotas*

The *Srotas* has the colour of the *Dhatu* (tissue) that they are carrying or transporting. They are of different shapes and sizes viz, round, thick, large, small, microscopic, elongated and form network and branches.[15] With this description, each and every cell can be considered as a *Srotas* since the transportation mechanism occurs within the cell and between cells.

Types of *Srotas*

Bahirmukha Srotas [16] – They are nine in male and twelve in female. *Netra* – 2, *Karna* – 2, *Nasa* – 1, *Mukha* – 1, *Guda* – 1, *Medhra* – 1. In female's *Yoni* – 1 and *Stana* - 2

Antarmukha Srotas

Srotas described in Charaka Samhita

- *Pranavaha Srotas*
- *Udakvaha Srotas*
- *Annavaha Srotas*
- *Rasavaha Srotas*
- *Raktavaha Srotas*
- *Mamsavaha Srotas*
- *Medovaha Srotas*
- *Asthivaha Srotas*
- *Majjavaha Srotas*
- *Shukravaha Srotas*
- *Mutravaha Srotas*
- *Swedavaha Srotas*
- *Purishavaha Srotas.*

Srotas described in Sushruta Samhita

- *Pranavaha Srotas*
- *Annavaha Srotas*
- *Udakvaha Srotas*
- *Rasavaha Srotas*
- *Raktavaha Srotas*
- *Mansavaha Srotas*
- *Medovaha Srotas*
- *Mutravaha Srotas*
- *Purishavaha Srotas*
- *Shukravaha Srotas*
- *Artavavaha Srotas*

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Medovaha Srotas

Dhatu are nourished through their respective *Srotasas*. The *Medodhatu* gets its nutrition from the *Srotas* called *Medovaha Srotas*. As per Dr. C Dwarkanath, the channels through which nutrition to the adipose tissue is transported are to be termed as the *Medovaha Srotas*. Dr Ghanekar B G considered the *Medovaha Srotas* as the capillaries of the perinephric tissue and omentum.

Concept of *Moolasthana*

In classical Ayurvedic texts concept of *Moolasthana* is focused. Although they have different opinion regarding *Moolasthana*, they considered it to be *Prabhavasthanam* i.e., from where all the activities of that particular *Srotas* take place and also which is affected most during pathological conditions. *Moolamiti Prabhavasthanam* is explains by the commentator of *Charaka Samhita Acharya Chakrapani* - 'If root of the tree is destroyed, it will cause harm to the whole tree. Likewise, if harm is caused to Srotomoola, it will lead to damage to whole srotas.[17]

Moolasthana

The *Medovaha Srotomoola* means the organ which may be closely related to *Medodhatu* functions or which are important sites related to beginning or ending of the channels of *Medodhatu*.

Acharya	***Moolasthana***
Acharya Charaka	*Vrikka* and *Vapavahan*
Acharya Sushruta	*Vrikka* and *Kati*
Acharya Vagbhat	*Vrikka* and *Mamsa*

Vrikka

One of the *Koshtanga* formed by the *Sara* of *Rakta* and *Medodhatu*.[18] According to *Dalhana* commentator of *Sushruta Samhita* stated that *Vrikka* looks like *Mamsapinda* and are two in number which are situates in left and right side of the quadrum.[19] By the word *Parshva* he probably means retroperitoneal situation. Acharya Sharangadhara stated that *Vrikka* nourishes the *Medodhatu* of the *Jatharpradesh*.[20]

The upper part of the kidney – supra renal gland, which control the secretion of epinephrine and non-epinephrine hormones actively participate in the breakdown process of the triglyceride.

Kidney does not filter the lipids. Kidney protects the lipids but the fact that filtration of fat does not occur and protections of lipids through kidney enhance fat in the body. This type of action is not seen with protein and carbohydrate, they are filtered and absorbed. Kidney is set to give special importance to lipids. If kidney will not filter urea the increase blood urea would have been cause inhibition of fat deposition. Approving the fact that it strengthens and built fat deposition in the body especially abdomen, which exactly is said by Acharya Sharangadhara. The other point to be considered is – hormones from adrenal cortex and medulla influence lipid metabolism. Glucocorticoids from adrenal cortex influence fat metabolism by influencing sterol metabolism and adipose tissue synthesis.[21]

Vapavahan

It is mentioned as *Koshtanga* and *Moolasthana* of *Medovaha Srotas*. *Vapavahan* means the transporter or carrier of *Vapa* (fat). Acharya Chakrapani has considered it as *Tailavartika* while Dr. Ghanekar has considered it as omentum, where the maximum *Meda* is stored.

Omentum is appeared as a thin fenestrated membrane with varying amount of fat deposition. The size of omentum varies from individual to individual. It is composed of two mesothelial sheets which enclose predominantly adipocytes embedded in a loose connective tissue. This adipose tissue plays an important immune role but can also serve as a source of chronic inflammation in obese individual possibly contributing to metabolic syndrome.[22]

Kati

Kati is the region where large amount of fat deposition occurs. In modern it is corelated with loan region whose exact side is lower part of back between

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the ribs and pelvic according to Taber's Cyclopedia medical Dictionary.

These days waist circumference – height ratio (WHtR) is recommended in screening cardiometabolic syndrome. Also, a number of studies on WHtR, WC and BMI have been proved valuable in prediction various metabolic syndromes like obesity, DM etc.[23]

Mamsa

Acharya Vagbhat has considered *Mamsa* as moolasthana of *Medovaha Srotas*. The probable reason may be due to its physiological role. Muscles, especially the skeletal muscles are known to store fat (IMCL- Intramyocellular Lipids).

Clinical Significance

Meda Dhatu Dushti Lakshana

Acharya	*Medokshaya*	*Medovriddhi*
Charaka	*Sandhisphootan, Akshglani, Ayasa, Udartanutvam*	*Ninditani, Pramehapoorvaroopam*
Sushruta	*Pleehavriddhi, Sandhisunyata, Raukshya, Medurmamsa Prathana*	*Snigdhangata, Udarparshva Vriddhi, Kasa, Swasa, Dourgandhyam*
Ashtanga Hridaya	*Katiswapa, Pleehavriddhi, Krishangata*	*Tadvat, Alpacheshtite Sranam, Swasa, Sphik-Stana-Udar Lambanam*
Ashtanga Samgraha	*Pleehavriddhi, Katiswapa, Sandhisunyata, Angaroukshaya, Karshya, Srama, Sosha, Medurmamsa Abhilasha, Mamsa Kshayokta Lakshan*	*Prameha Poorvaroopam, Sthoulya, Sleshma Mamsa, Rakta Vikara*

Medovahsroto Dushti and *Sroto Viddha Lakshana*

Acharya Charka has described *Srotodushti* Lakshana while *Acharya Sushruta* has explained Srotoviddha *Lakshana*

Medovahsrotodushti Lakshana	*Medovahsrotoviddha Lakshana*
Ashtanindita *Pramehapoorvaroopam*	*Swedagmana* (excessive sweating) *Snigdhangata* (oily skin/organs) *Talushosha* (dry mouth) *Sthaulya* (obesity) *Sopha* (inflamation) *Pipasa* (thirst)

Ashtanindita	*Medoroga*
Atidheerga (excessive tallness)	*Medagranthi*
Atiharshva (dwarfism)	*Antravriddhi*
Atiloma (excessive hairs)	*Medovriddhi*
Aloma (lack of body hairs)	*Galaganda*
Atikrishna (extreme dark colour)	*Arbooda*
Atigaur (extreme fair colour)	*Prameha*
Atisthula (obesity)	*Sthaulya*
Atikarshya (underweight)	*Atisweda*

As per *Acharya Sushruta* by the study of a single *Shastra*, a man can never catch the true importance of this (science of medicine). Therefore, a physician should study as many as allied branches related with this science. Hence, to understand the concept of *Moolasthana* lets throw some tight on modern literature.[24]

Swedagmana - Adrenal gland disorder can cause the adrenal medulla to produce increased level of epinephrine and norepinephrine. These hormones act on the sympathetic nervous system, leading to excessive sweating.

Swasa - Numerous respiratory complications are associated with obesity. Obese individual has an increase demand for ventilation and breathing workload, respiratory muscle insufficiency, decreased functional reserve capacity and respiratory reserve volume and closure of peripheral lung units. Obesity is a classical cause of alveolar hypoventilation.[25]

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Taalu Sosha - The sensation of dry mouth including palate will occur when the salivary flow rate is less than the rate of water absorption from the mouth. A dry mouth is a symptom as well as cause of high blood sugar.

Pipasa - The cause of Pipasa is may be due to decrease blood volume without reducing the intracellular fluid. The decreased blood volume is distinguished by cells in the kidney and elicits thirst for both water and salt via the rennin-angiotensin mechanism.

Sopha - Abnormal and excessive accumulation of free fluid in the interstitial tissue space and serous cavities. Extra renal mechanism involves the secretion of aldosterone, a sodium retaining hormone by the renin angiotensin aldosterone system

Sthoulya - In obeys individual two distinct phenotypes are apparent – generalised obesity and abdominal obesity. Of this abdominal obesity is strong indicator for development of coronary artery disease, insulin resistance and consequently type -2 diabetes mellitus and many comorbid conditions.[26]

A BMI between 18.5 and 25 kg/m2 is considered by the World Health Organization (WHO) to be normal weight, a BMI between 25 and 30 kg/m2 as overweight, and a BMI of>30 kg/m2 as obese. Alternative parameters to more accurately capture visceral fat include waist circumference (WC) and a waist hip ratio (WHR) of >102cm and 0.9, respectively, for men and >88cm and >0.8, respectively, for women. WHR has been shown to be superior to BMI for the correct classification of obesity in CKD.

Obesity has become a worldwide epidemic, and its prevalence has been projected to grow by 40% in the next decade. This increasing prevalence has implications for the risk of diabetes, cardiovascular diseases and also for chronic kidney diseases (CKD) – CKJ OXFORD. This increasing prevalence of obesity has implications for cardiovascular disease (CVD) and also for CKD. A high BMI is one of the strongest risk factors for new-onset CKD.[27]

Prameha - In 2017, about 72 million people (8.8% of the total population having age 18 years or above) and 20% of the urban population was diabetic in India (International Diabetes Federation (IDF).[28] According to Diabetes Foundation of India, people suffering from diabetes are likely to go up to 80 million by 2025, making India the 'Diabetes Capital' of the world.[29] Over nutrition has been found to be a major risk factor for a number of diseases such as diabetes, hypertension, heart diseases, certain type of cancers, etc.[30] Huffman et al consider a cohort sample of 1100 women in South Delhi and show that an increase in BMI has a statistically significant impact on diabetes among married women in Delhi, India.[31] The study by Ramachandran et al. finds a positive association between diabetes and BMI for the urban population across six cities in India using the National Urban Diabetes Survey.[32]

DISCUSSION

In metabolic syndrome, the abnormal *Meda*, when deposited into subcutaneous tissue, it gives the clinical presentation of obesity and similarly when *Abaddha Meda* extracted to *Basti* it creates the manifestation of *Prameha* and when this *Meda* is unnaturally deposited in the arterial wall and increase the peripheral resistance (Dhamnipratichaya/arteriosclerosis) it shows clinical manifestations like HTN and when these unnatural *Meda* present in the *Rakta Vaha Srotas* leads to increase level of unwanted fat level - hypercholesterolemia. The formation of *Meda* not only depends on over consumption but also due to less utilization. The modern life style makes the human being more comfortable.

The management of disease caused due to vitiation of *Medovaha Srotas* should be done on the basis of line of treatment of *Medo* Roga.[33] *Nidana Parivarjana, Samshaman* and *Samsodhana Chikitsa* should be done. In the treatment of obesity *Guru Aptarpana* should be done. And in the treatment of *Prameha* it is said that - The basic concept of utilization of excess energy should be done through physical exercise. It is mention by *Acharya Sushruta* that – walking without rest for a distance of hundred Yojana, is one of the best remedies for *Sthula Pramehi*.

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The same management criteria which have been described by our Acharyas hundreds of year back has been proven scientifically now a days on the basis of modern research which the world is obeying. The following are the few examples-

In overweight or obese diabetic patients, a lifestyle intervention including caloric restriction and increased physical activity compared with a standard follow up based on education and support to sustain diabetes treatment reduced the risk for incident CKD by 30%.[34]

In a recent meta-analysis collating experimental studies in obese CKD patients, interventions aimed at reducing body weight showed coherent reductions in blood pressure, glomerular hyper-filtration and proteinuria.[35]

Globally, these experimental findings provide a proof of concept for the usefulness of weight reduction interventions in the treatment of CKD in the obese.[36]

Population-wide interventions to control obesity could have beneficial effects in preventing the development, or delaying the progression, of CKD, CVD, and DM etc. It is incumbent upon the entire healthcare community to devise long-ranging strategies toward improving the understanding of the links between obesity and related diseases, and to determine optimal strategies to stem the tide.

The original alarm was sounded in 1994 by the National Centre for Health Statistics when they reported their data from the first 3 years of the National Health and Nutrition Examination Survey (NHANES). The authors observed that from 1988–1994 (NHANES III) to NHANES 1999–2000, the prevalence of overweight in adults increased from 55.9% to 64.5%. During that same period, the prevalence of obesity increased from 22.9% to 30.5%. This sudden, unanticipated jump in the prevalence of obesity led the American Heart Association (AHA) to call for action to curb the consequences of this epidemic.[37, 38] More recently the AHA has addressed and reviewed a variety of weight loss approaches for the management and treatment of obesity.[39]

Conclusion

On the basis of the above facts, it may be concluded that assessment of *Moolasthana* of *Medovaha Srotas* and scientifically consideration of *Moola Sthana* of *Medovaha Srotas* i.e., *Vrikka, Vapavahan, Mamsa* and *Kati* is true scientific explanation. The two *Vrikka* are the *Moola* of *Medovaha Srotas* located in the *Kostha* near the *Prustavansh* same as kidney within the paranephric fat present in the posterior abdominal cavity parallel to vertebral column. *Vapavahan* can be correlated with omentum as it is present in *Udar* where the excess amount of *Meda* (triglyceride) is stored. *Kati* is the area same as lumbar region, where storage of *Meda* (triglyceride) takes place.

The fact that the intra- abdominal adipocyte is more lypolytically active than those from other depots. This mechanism is vivid in the mind of our acharyas. Hence, they considered the depots of intra-abdominal fat as the *Moola Sthana* of *Medovaha Srotas* considering *Vrikka, Vapavahan, Kati* and *Mamsa*. The concept of *Sroto* vitiation and management which has been explained in our texts thousands of years back are being scientifically proven by the contemporary medical science in the form of researches and statistically calculated results. Thus, complete knowledge of *Srotas* is must for an Ayurvedic Physician to approach a patient in a holistic way and to cure the disease from its roots.

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