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CASE STUDY

A Study of Medo-dhatu and its Effect on the Clinical Cases of Sthaulyata (Obesity)

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INTRODUCTION

In the present era of civilization a person is not aware towards his ideal health because he is busy to achieve physical pleasure as early as possible. A person will be completely healthy if he follows the dictums of Tripods of Life (*Triupstambh*) i.e. Āhāra, Nidrā and Brahamcarya[1]. Āhāra is important among the others because it maintain the equilibrium state of Doṣa, Dhātu and Mala, so the Nidrā and Brahamcarya are dependent on Āhāra. If a person indulges in improper Āhāra he may suffer with various types of health hazards. Overeating leads to Sthaulyatā (Obesity) and under eating leads to Kriśtā (general body debility).

Sthaulyatā is a serious disease with grave prognosis than Kriśtā [2]. An old saying "one's own grave with one's teeth" can be truly applied for a civilized society because very few people die of hunger whereas more die because of overeating.

Sthaulyatā is a disorder of Medo-dhātu metabolism. It is the fourth dhātu of the body, which is derived from Māṇsa dhātu [3]. The equilibrium state of Medo-dhātu depends upon Jātharāgni (GIT level), Bhutāgni (hepatic metabolism) and Dhatwāgni-pācakā-anṣa (tissue cellular metabolism). Sthaulyatā or Medoroga is due to abnormality of Medas Bhutāgnipāka and Dhatwāgnipāka while the Medas digestion by Jātharāgni (GIT level) is in normal state [1].

Sthaulyatā is a disease of various endocrine-hormonal disorders and faulty food habits (Mithyā Āhāra and Vihār)-It is characterized as pendulous appearance of breasts, buttocks and abdomen [4].

The question arises that is Vasā, Majjā, Meda are similar or different from each other and what could be understood about them with the help of modern science.

In the present work formation of Medo-dhātu through Agni Vyāpāra has been taken into consideration. Along with this difference between Vasā, Majjā, Meda and Vapā have been tried to be explained. An understanding has been developed about Medo-dhātu about its digestion, absorption and assimilation and also about circulatory and depot fat with the help of modern knowledge [5]. An attempt has also been made to understand Medoāgni on the basis of modern science and how vitiation of medovaha srotas leads to staulayata (obesity).

MATERIALS AND METHODS

A total number of 50 patients of Sthaulyata were taken from the OPD/IPD of Kayachikitsa Department of State Ayurvedic College and Hospital, Lucknow out of which 40 patients turned out with their investigations.

Plan of Study

The study was done under the following steps: --

(A) Conceptual Study
(B) Clinical Study

(A) CONCEPTUAL STUDY

The classical concept of Dhātu in Āyurveda was taken with detailed study of Medo-dhatu. Medo dhātu formation and its agni was assessed on the basis of Laboratory investigations.
The specific study of Sthaulyatā with its modern interpretations and the patients of Sthaulyatā were categorized according to modern diagnosis.Medo-dhatu its digestion and absorption in the view of modern science was studied to highlight Medo-dhatu with relation to Sthaulyatā.

(B) CLINICAL STUDY

1) Selection of Cases

The patients were diagnosed on the basis of clinical and necessary laboratory investigations.

2) Criteria of Selection of Cases

A) Patients having clinical features of Sthaulyatā as described by Ācārya Charak.

1. Chal sphik, udara, stana (Pendulous buttocks, abdomen, breasts)
2. Javoparādha (Hampering of movement
3. Krichhavyavāyatā (difficulty in intercourse)
4. Daurbalyam (General weakness)
5. Daurgandham (Bad odour of the body)
6. Swedabādha (Excessive sweating)
7. Kshudāatimātrama (Excessive appetite)
8. Pipasāatiyoga (excessive thirst)
9. Kshudraśvāsa (difficulty in breathing)
10. Nidratā (excessive sleep)
11. Āayāsa (inability to withstand exertion)

B) Patients were with both sex and age ranging from 15-60 yrs.

C) Patients who comes under the category of Grade 2 and 3 overweight to W.H.O. criteria i.e. B.M.I, greater than 30.

W.H.O. CLASSIFICATION OF OVERWEIGHT

B.M.I.	**WHO Classification**	**Description**
<18.5 kg / m^2	Underweight	Thin
18.5-24.9 kg /m^2	----------	Healthy, Normal
25.0-29.9 kg /m^2	Grade 1 overweight	Overweight
30.0-39.9 kg/m^2	Grade 2 overweight	Obesity
≥ 40.0kg/m^2	Grade 3 overweight	Morbid Obesity

D) LABORATORY INVESTIGATIONS

1. Blood – Hb%, TLC, DLC.Fasting Blood Glucose, Random Blood Glucose
2. Thyroid Function Test – T_3, T_4, TSH
3. Lipid Profile –Cholesterol, Triglycerides, LDL, HDL, VLDL
4. Urine – Routine Microscopic
5. E.C.G
6. Others (if required)

EXCLUSION CRITERIA

1) Patients of extreme age groups (below 15 yrs and above 60 yrs).
2) Patients who's BMI was lower than 30.
3) Patients suffering from Cushing's syndrome.
4) Patient taking those drugs which cause retention of water in the body for example, taking steroids for a long time.

STUDY DESIGN

All patients were thoroughly interrogated about their socio-demographic study such as age, sex, religion, occupation, marital status, habitat, and personal study including dietary habit, exercise, addiction, etc.
Later the diagnosis was established by

a) Chief complaints

b) Detailed history
c) Questionnaire of symptoms described in Charak Saṃhitā
d) Past history
e) General and Systemic examination

RESULT

Table1: Showing the incidence of Śaririk Prakṛti in patients of Sthaulyatā(Obesity).

Śaririk Prakṛti	Group-1		Group-2		Total	
	No.	Percentage	No.	Percentage	No.	Percentage
Vāta-Pittaj	4	17.4%	1	5.9%	5	12.5%
Pitta-Kaphaj	7	30.4%	7	41.2%	14	35%
Kapha-Vātaj	12	52.2%	9	52.9%	21	52.5%
Total	23	100%	17	100%	40	100%

Person having Vata-kaphaj Prakṛti is predominantly obese. It is due to the pathogenesis of the disease that Tridoṣa mainly Kapha Doṣa produces obesity.

Table 2: Showing the incidence of Āhāra-Śakti in patients of Sthaulyatā(Obesity).

Āhāra-Śakti	Group-1		Group-2		Total	
	No.	Percentage	No.	Percentage	No.	Percentage
Pravar	6	26.1%	13	56.5%	13	32.5%
Madhyam	17	73.9%	10	43.5%	27	67.5%
Avara	0		0		0	
Total	23	100%	23	100%	40	100%

According to the Āhāra-śakti mainly patients were of Madhyam āhāra śakti(67.5%) followed by Pravara āhāra śakti (32.5%). No patients were found with Avara āhāra śakti. This shows that the people having input (Calories) more than output (working in form of energy expenditure) suffer more from the disease of obesity.

Table 3: Showing the grade of obesity based on Symptoms in patients of Sthaulyatā (Obesity).
A) On the basis of Physical measurement.

S.N.	Physical measurements	Mean ± S.D.		Between the group Comparisons unpaired t test
		Grade-1 (Symptoms ≤6) n=20	(Symptoms >6) n=20	
1.	BMI (kg/m^2)	33.04±1.22	36.36±2.14	t=6.04p<0.05
2.	Waist (cm)	107.50±7.32	114.05±11.06	t=2.21p<0.05
3.	Hips (cm)	114.50±6.19	120.95±4.55	t=3.76p<0.05
4.	Wrist (cm)	17.65±1.27	17.63±1.08	t=0.07p>0.05
5.	Forearm (cm)	25.67±1.95	25.58±2.29	t=0.14p>0.05
6.	Subscapular (cm)	3.27±0.41	4.04±0.88	t=3.59p<0.01
7.	Midaxillary (cm)	3.09±0.40	4.04±0.87	t=4.40p<0.05
8.	Triceps (cm)	3.34±0.66	3.75±0.76	t=1.82p>0.05

This shows fat accumulation in waist and hip region as well as in peripheral or in subcutaneous tissue region.

B) On the basis of Laboratory values.

S.N.	Laboratory Values	Mean ± S.D.		Between the group Comparisons unpaired t test
		Grade-1 (Symptoms ≤6) n=20	(Symptoms >6) n=20	
1.	Hemoglobin (gm/dl)	12.53±1.52	13.32±1.43	t=1.68p>0.05
2.	Fasting Blood Glucose (mg/dl)	82.70±13.16	103.90±21.76	t=3.73p>0.05
3.	Random Blood glucose (mg/dl)	125.50±17.38	145.35±39.11	t=2.07p<0.05
4.	Cholesterol (mg/dl)	201.61±39.84	227.28±72.30	t=1.39p<0.05
5.	Triglycerides (mg/dl)	226.91±59.27	285.60±106.02	t=2.16p<0.05
6.	HDL (mg/dl)	36.19±4.41	34.47±8.69	t=1.75p<0.05
7.	LDL (mg/dl)	96.17±18.04	105.54±30.21	t=1.19 p<0.05
8.	VLDL (mg/dl)	45.49±18.63	49.37±23.15	t=0.58p>0.05
9.	T_3 (ng/dl)	125.25±35.09	144.16±20.11	t=2.15p<0.05
10.	T_4 (µg/dl)	5.91±2.80	7.86±1.54	t=2.73p<0.05
11.	TSH (IU/dl)	6.27±4.19	7.04±7.09	t=0.42p>0.05
12.	Intake calories(Kcal)	3229.35±443.45	3472.90±702.30	t=1.31p<0.05

It reveals that the HDL decreases as the symptoms in patients increases due to less activity. Thus it is seen in the studies that HDL has some relation with the motility of the person. HDL concentration is inversely related to the incidence of coronary atherosclerosis, possibly they reflect the efficiency of cholesterol scavenging from the tissues.

Table 4: Showing group wise variations in cases of Sthaulyatā (Obesity).On the basis of Laboratory variations

S.N.	Laboratory variations	Mean ± S.D.		Between the group Comparison unpaired t test
		Group-1 (BMI 30-35) n=23	Group-2 (BMI>35) n=17	
1.	Hemoglobin (gm/dl)	12.37±1.48	13.67±1.23	t=2.95p>0.05
2.	Fasting Blood Glucose (mg/dl)	83.26±12.72	106.88±22.04	t=4.28p>0.05
3.	Random Blood Glucose (mg/dl)	126.65±16.51	147.29±42.27	t=2.14p<0.05
4.	Cholesterol (mg/dl)	198.26±39.11	236.32±74.27	t=2.10p<0.05
5.	Triglycerides (mg/dl)	227.31±63.70	295.41±106.12	t=2.53p<0.05
6.	HDL (mg/dl)	37.23±6.33	32.75±7.81	t=2.00p>0.05
7.	LDL (mg/dl)	98.35±18.70	113.10±38.66	t=1.60p<0.01
8.	VLDL (mg/dl)	45.57±18.47	49.95±24.03	t=0.65p>0.05
9.	T_3 (ng/dl)	123.22±33.24	145.54±16.07	t=2.55p<0.05
10.	T_4 (µg/dl)	6.23±2.78	7.77±1.56	t=2.05p<0.05
11.	TSH (IU/dl)	6.32±4.44	7.10±7.31	t=0.42p>0.05
12.	Intake calories(Kcal)	3196.5±441.18	3560.3±712.63	t=1.99p<0.05

Thus it was seen that as the B.M.I. was increased, Cholesterol and Triglycerides levels in the blood also increases. It means that obese patients become prone to complications such as atherosclerosis, dyslipidemia, etc. with increasing Obesity.

DISCUSSION

The sperm and the ovum when gets fertilized, a zygote is formed. The zygote then increases in size and divides into two celled, four celled, eight celled, etc; the new cells are being formed. Unicellular structure divides and re-divides to form a multicellular structure in respect of Anatomy and Physiology. The cells of similar structure and function are grouped together in the body to perform similar functions and these groups of similar functions and these group similar cells are called Tissues [Dhātus]. Thus the Dhātu is the Anatomico-physiological state of our body [4].

Doṣa, Dhātu and Malās are the pillars of our body. The dhātus are seven in number – Rasa (Plasma and Lymph), Rakta (Blood cells), Māṇsa (Muscular and general connective tissue), Meda (Body lipids including adipose tissue), Asthi (Hard tissue like bone), Majjā (Bone marrow and connective tissue), and Shukra (factors responsible for reproductive functions) are the basic tissues [4].

Agni is the metabolic unit of our body. It is a same nature as fire. The physical fire prepares the Anna to assimilate the body and biological fire which assimilate the āhāra to the Dhātus. The Agni is essential for the health, longevity and death. Medo-dhātu is the fourth dhātu of the body which is derived from Māṇsa dhātu by the action of Mānsāgni and Ap mahābhūta so it gets distinctiveness of Sneha, Mārdava, Sthāyītva and Gurutva due to characteristics of Prithvi and Jala mahābhūta [5].

The vitiation in Medo-Dhātu can be either medovṛddhi or medakṣaya. Ācārya Caraka and Suśruta both have narrated the characteristics pertaining to medavṛddhi and medakṣaya [6].

Due to excessive vṛddhi in meda, person appears obese and when he walks the fat and pendulant buttocks, abdomen and breasts also moves. According to Bhāv Prakāsh, obese person are more likely to develop complication such as leprosy (skin diseases), fistula, fever, diarrhea, diabetes-mellitus, fissure, elephantiasis, jaundice, etc. There are two types of Medas found in the body –

1. Baddha Medas 2.Abaddha Medas

Baddha Medas means Medas which is in bind and compact form and Abaddha Meads means Medas which is in noncompact and free form, circulating in the body. The relation of Baddha and Abaddha Medas with the modern lipids can be understood on following points. The lipids carried in the blood stream may have one of the several destinations:-

- Deposition of body fat in Adipose tissue
- Temporary storage and alteration in the liver
- Oxidation in the tissues

Depot fats, which are stored in special mesenchymal cells known as Fat Cells or Adipocytes, are nothing but only BADDHA MEDAS. These are found chiefly in omentum, mammary glands, hip region, etc. Lipid in the living animal is in liquid state and is chiefly neutral fat.

But some fat cells are also found in the interstitial connective tissue of muscles and above the muscles, in the parenchymal cells, containing little or no neutral fat, instead saturated fatty acids, phospholipids and cholesterol which can be taken as Vasā. According to Ācārya Suśruta Vasā is Updhātu of Māṇsa dhātu, which form an insulating layer of the body above the muscle layer.

Liver plays an important role in systemic metabolism of lipids. All the phospholipids are constantly being made in the liver. However, all the tissue cells apparently can synthesize some cholesterol and some phospholipids for their own structural use, but the bulk of the fatty acids which they use for oxidation are supplied from the phospholipids made in the liver. These are ABADDHA MEDAS which circulate in the body via blood circulation.

Obesity is a state of excess adipose tissue mass. According to Āyurveda, obesity occurs as the result of derangement metabolism of Medas-dhātu [6].

CONCLUSION

1. The main constituents of the body are Doṣa, Dhātu and Mala. These are functional, structural and excretory constituents of human being.

2. The word Medas is used for the different kinds of lipids either stored or circulating in the body. The Baddha medas is depository fats and the Abaddha medas is circulatory fats.
3. The other terms used like Medas are Sarakta medas, Vasā and Vapā.
4. The Medas resides in the small bones (Anuasthi) is called Sarakta Meda (Red bone marrow). Vasā is updhātu of Māṇsa dhātu and it may be taken as fat found in the interstitial connective tissue of muscles and above the muscles. Vapā is also similar to Medo-dhātu and situated in abdomen as visceral (peritoneal) fat.
5. The Serum Cholesterol, Triglycerides, HDL, LDL, VLDL and deposited fats are considered as in Medo-dhātu. The total amount of Medo-dhātu is Two Anjali and total amount of lipids in the body are 16% of the body weight.
6. Sthaulyatā is a disease due to various endocrine hormonal disorders, like Hypothyroidism, etc and due to faulty food habits as observed in clinical examinations and history.
7. Atisthaulyatā is a diseased condition in which B.M.I. ranges from 30-40 kg/m^2 while Sthaulyatā is a pre-disease condition in which B.M.I. varies from 25-30 kg/m^2.
8. Sthaulyatā is a disease described in all Āyurvedic classics. It is called Nindanīya because of having a lot of complicated diseases and with less life span (Ayushohraṣa).
9. The demographic study reveals that Sthaulyatā is very common in Kapha-Vātaj prakṛti, Dyslipidemia was observed in 76% patients while 24% cases were having normal lipid profile.
10. Most of the clinical feature described by Ācārya Carak and others were found in patients whose B.M.I. was between 35-40 (Grade-2^{nd} obesity) like Chal sphik-udar-stana, Nidratā, Āayasa, Swedabādha, Kshudāatimātram.
11. Thus it was seen that as the B.M.I. was increased, Cholesterol and Triglycerides levels in the blood also increases. It means that obese patients become prone to complications such as atherosclerosis, dyslipidemia, etc with increasing Obesity.
12. Thus Sthaulyatā is a multifactorial disease caused by various hormonal disorders as well as due to faulty food habits. Present work will certainly help to evaluate the risk factors of Obesity and give the guideline to treat the patients and save the precious human life. However, Further studies are suggested on various fragments of Medo-dhātu and should be analyzed in large scale of patients.

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