



## UNDERSTANDING THE ROLE OF AMA IN ETIOPATHOGENESIS OF METABOLIC SYNDROME

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### ABSTRACT

Recent past years have seen alarming increase in cases of metabolic syndrome with the overall prevalence rate of 33.5%. that too more in females (42.3%) than males (24.9%).<sup>1</sup> Metabolic syndrome represents its relationship with metabolism and cluster of events like Abdominal (central) obesity, Elevated blood pressure, Elevated fasting plasma glucose, High serum triglycerides and Low high-density lipoprotein (HDL) levels. All these conditions overall increase the cardiovascular risks. In ayurveda, no terminology has been found for Metabolic Syndrome but Mandagni is said to be the cause for all the diseases and the substance which is not digested properly or the substance which is partially metabolized due to mandagni is considered as AMA. Ama causes obstruction of the srotas (channels) and leads to the accumulation of metabolic toxins or the formation of sama rasa and sama medo dhatu, which explains the condition like diabetes Mellitus and enlarged circumference in terms of ayurveda. Also similar to Metabolic Syndrome described in contemporary medicine, Sthaulya as stated in ayurveda is a cluster of various pathological conditions and shows similar symptoms as MS. So, by exploring the concept of ama, pathogenesis of Metabolic Syndrome can be better understood in ayurvedic context.

### KEYWORDS : Mandagni, Agnimandya, Ama, Metabolic Syndrome.

#### INTRODUCTION

Recent past years have seen alarming increase in cases of metabolic syndrome with the overall prevalence rate of 33.5%. that too more in females (42.3%) than males (24.9%). It is increasing rapidly with affecting 20~25% of the adult population worldwide probably as a result of prolonged life expectancy and obesity, population aging and deficient nutrition.<sup>1</sup> 'Metabolic syndrome' represents its relationship with metabolism and cluster of at least three of the events mentioned below

- Abdominal (central) obesity
- Elevated blood pressure
- Elevated fasting plasma glucose.
- High serum triglycerides and Low high-density lipoprotein (HDL) levels.

No terminology has been found in ayurvedic texts for metabolic syndrome but wide description of concept of agni is mentioned in the ancient texts which has a direct correlation with metabolism.

As per ashtang hridaya, Mandagni is the root cause for all the diseases. the substance which is not digested properly or the substance which is partially metabolized due to mandagni is considered as AMA. Ama causes obstruction of the srotas (channels) and leads to accumulation of metabolic toxins which is responsible for loss of homeostasis, inflammation, and tissue damage<sup>2</sup> which alters the equilibrium of the metabolism and this disequilibrium causes metabolic syndrome.

#### AIM AND OBJECTIVE

To find the role of Ama in etiopathogenesis of Metabolic Syndrome.

#### MATERIALS AND METHODS

References regarding Ama dosha and *agnimandya* have been collected from *bruhat trayi* and *laghu trayi* and various text books. Different journals and previous research works are also referred to collect the informations about the relevant topics.

#### REVIEW AND DISCUSSION

##### ETYMOLOGY OF AMA

Word Ama is originated from the root 'am' and has suffix 'ninj' i.e., the substance which is not digested properly or the substance which is partially metabolized is considered as AMA. Ama causes obstruction of the srotas (channels) Literal meaning of AMA (as a prefix to verbs and nouns) is near to poison. So ama denotes as a group of substances which acts like poison which harms a healthy body state.

**SYMPTOMOLOGY OF AMA:** Various symptoms are seen due to Ama in body which are mentioned in texts these symptoms help in the clinical diagnosis of the Ama. *sama* and *niram* stages of diseases can

also be identified through these symptoms. Acharya Vagbhatt in *ashtanghridaya* has described these symptoms as; *Srotorodha*, *balabhransa*, *gaurava*, *anilmudhata*, *alasya*, *apakti*, *nishthiva*, *malsanga*, *aruchi*, *klama*.

Acharya Madhav has also mentioned symptoms of Ama as; *Angamarda*, *trnsa*, *jwara*, *praseka*, *utshahani*, *vairasyta*, *daha*, *bahumutrata*, *kukshikathinta*, *nidraviparyaya*, *chardi*, *srama*, *murcha*, *vidavibandham*, *jadyata*, etc.<sup>3</sup>

**Srotorodha:** Due to the properties like pichhilta and snigdhta Ama adheres to the wall of srotas due to which lumen of srotas becomes narrow Once it becomes narrow normal functioning of srotas become disturbed which leads to disease production.

**Balabrnsa:** This is caused due to systemic effect of circulation of Ama in the body. It causes reduced working power of dosha dhatu and mala.

**Gaurav:** Ama causes heaviness in body and some parts of the body due to its accumulation.

**Anilmudhata :** Due to accumulation of Ama in the lumen of srotas free flow of vayu becomes obstructed this condition is known as anil mudhata.

**Alasya:** It is due to physiological effect of Ama along with *guruta*. Due to Ama psychologically disturbed patient becomes unable to perform normal activities which is known as alasya.

**Apakti:** Like a vicious circle set by Ama, mandagni leads to production of Ama and Ama further causes mandagni. This condition is known as apakti. It indicates metabolic impairments due to effect of Ama at micro level

**Nishthiv:** Excessive salivation due to development of excess kapha dosh by Ama.

**Malasang:** constipation due to improper digestion of food

**Aruchi:** Lack of taste

**Klama:** Lethargy due to obstruction of srotas channels by Ama. Acharya Charak has mentioned Ama dosha in *Vimana Sthana 2*, *trividhakukshiyadyaya*.

He says, physicians describe two types of diseases caused by Ama dosha;

1. **Visuchika**; The expulsion of Ama dosha through both upper and lower passages of the gastrointestinal tract with the features of ama dosha.

2. **Alasaka**; All the characteristic features of Ama dosha, devoid of vomiting and diarrhea, are manifested severely in *Alasaka*

**MANIFESTATION OF DISEASE DUE TO AMA;**

Acharya Madhav, in *Amavataniadanadhya* has mentioned that, A man who exercises immediately after eating solid or oily food, being inspired by the vitiated air, ama goes towards the *sthan* of Kapha Dosha, the stomach, the joint and the head and the throat. its transport through the arteries is then facilitated by *vayu*. along with all the three doshas located in the arteries, it becomes more contaminated. This causes weakness and heaviness in the heart.<sup>4</sup>

Since in modern aspect *amavata* is correlated with Rheumatoid Arthritis. because ama dosha along with *vaat* get deposited in joints and causes pain and inflammation which shows similar symptoms to rheumatoid arthritis.

Similarly if we understand the concept of ama transporting through the *dhamani*, to all the organs (heart, joints, head and other visceral organs) it interacts with all the three doshas located in the arteries and these *saamdoshas* blocks the channels (*srotoavrodha*) with different *ghan- snigdha-picchila* properties. Then it causes various symptoms depending upon the *srotas* it blocks and organs it affects.

Aacharya Vagbhata in *Matrasheetiyam aadhayaya* explains the properties of Ama as 'Ashu' and 'Yugpat'. Ashu means quick or fast acting and *yugpat* means it can combine with doshas easily. Which shows ama can lead to the formation of diseases rapidly by acting with doshas

**COMPREHENSIVE CORRELATION OF METABOLIC SYNDROME**

Metabolic Syndrome is a condition which arise due to deranged metabolism at various levels and in ayurveda this condition occur due to *Agnimandya* which is reflected by the formation of intermediary products and its accumulation in the body. This intermediary products can be considered as ama rasa dhatu , *sama medo* dhatu etc.

**SAMPRAPTI GHATAK<sup>5</sup>**

- Dosha- (Samanya) - Kapha predominant*
- (Vishesha) - Kledaka kapha*
- Dushya - Medo dhatu & Rasa dhatu*
- Agni - Jatharagnimandyata & Medodhatwagnimandyata*
- Srotasa - Rasavaha & Medovaha*
- Srotodushti Prakara - Sanga*
- Adhithana - Sarva Sharir gata Dhamani and Udara, Sphiga*
- Udabhava sthana - Aamashaya*
- Prasara - Rasayani*
- Rogamarga - Bahya & Madhyama*
- Swabhava - Chirkari*

**PATHOGENESIS**



A close relation can be seen between the key features of metabolic syndrome and the effect of ama on rasa, medadi dhatu;

**Relation of ama rasa dhatu and diabetes mellitus.<sup>6</sup>**

*Mandagni* leads to diminished *rasagni* due to which *rasadhatu* is not properly made which then acts as ama and is called as ama rasa dhatu which produce symptoms like *Aruchi, Angmarda, Srotorodha, Agni Nasha, Mukh vairasya, Hrillasa, Tandra, Gaurav, Khalitya, Palitya*.<sup>1</sup>. As it's seen in Diabetes Mellitus where insulin formation is impaired which in turn leads to hyperglycemia and shows similar symptoms.

**Relation of Enlarged waist circumference or central obesity with sama medo dhatu.<sup>6</sup>**

Here *Mandagni* leads to diminished *medoagni* and improper production of medo dhatu i.e. sama medodhatu and its deposition in the central region of the body leads to central obesity (*udarparsbhavridhhi*) Sama medo dhatu shows symptoms of *Sthaulya* (Obesity) , *prameh* (DM) and *atiswedi* ( excessive perspiration). Acharya Charak has enlisted 8 features or defects underlying *Sthaulya* purush;

- Ayuhrasa* (reduced life span), *Javoparodha, alpavyavayita* (decreased sexual power), *Daurbalya* (weakness), *Daurgandhya* (foul smelling from body), *Ati-sweda* (excessive sweating), *Attrishna* (excessive thirst) and *Atikshudha*.(excessive hunger)

Thus, the Metabolic Syndrome as it is described in contemporary medicine and Ayurveda's *Sthaulya* both are a cluster of various pathological conditions. And Several conditions have close relation in both the literature including central obesity, being overweight with an accumulation of fat primarily around the waist and trunk, high blood pressure, abnormal cholesterol levels, impaired fasting glucose, insulin resistance, hyperuricemia, and fatty liver that progresses to non-alcoholic fatty liver degeneration.

**Relation of Atherosclerotic Changes with Raktavaha Srotas.**

When we compare the qualities of kapha dosha and ama dosha , similar properties like *snigdhta , picchilata, guruta* are observed and acharya Charak has mentioned the term *Dhamanipraticchaya* in *Kaphananatmaja vikara*<sup>5</sup> which is very similar to the atherosclerotic changes we observe in metabolic syndrome, it is a major pathological event which leads to various pathological conditions like coronary artery disease, Hypertension ,cerebrovascular accident, peripheral vascular disease etc. here also ama plays a role as an etiological factor because when ama obstruct the *raktavahasrotas* ,it effects the normal flow of blood by decreasing the lumen of the arteries due to its *kapha sadharmi ansh*.

**Relation of Ama with Mutra in Diabetes Mellitus.<sup>6</sup>**

In Diabetes Mellitus, due to impaired glucose metabolism, excess glucose is excreted through urine. Similarly, in the condition of sama mutra awastha, *Basti peedan, Avilmutrata, Atyadhika mutra nirharan* lakshanas are observed. due to the *picchila* guna of ama, sama mutra is more viscous (*Avilmutrata*) and *prabhuta avilmutrata* is the *pratyatma* lakshana of *Prameh*. i.e., increased urine formation and excretion this explain the role of ama in D.M. and *atyadhika mutra nirharan* is a key feature observed in most of the pathological conditions associated with ama. Like *amavata* (Rheumatoid Arthritis).

**Relation of Ama and Metabolic Syndrome with autoimmunity.**

till now we have found enough evidences to understand the role of ama in the development of metabolic syndrome but since ama is considered as a metabolic toxin which acts as an antigen, it's important to understand the response of our immune system against it with respect to M.S. Since, ama is an unwanted by-product and contains antigenic properties, so it is capable of initiating autoimmune reactions which further leads to the vitiation of the srotas system of our body. As this enters the deeper tissues, it, inhibits cellular permeability by coating or clogging the cell membranes and begins to accumulate in the body tissues at various levels. So ama is not a single entity but a variety of deformed substances at different levels of our body for example, Uric acid formation due to impaired protein metabolism. Ketone body formation due to impaired carbohydrate metabolism.<sup>7</sup>

In metabolic Syndrome, the metabolic pathways in adipose tissue and inflammatory immune response have a significant relation. Here, as ama plays a role as an antigen along with other factors viz. cells of the adaptive immune system, including T and B cells causes adipose tissue inflammation. And many possible inflammatory mediators play a role in insulin resistance pathogenesis also, such as tumor necrosis factor- $\alpha$ , interleukin-6, leptin, and adiponectine. <sup>8</sup>

**Comparison of Causative factors of ama and Metabolic Syndrome;**

Nidana (cause)	Factors associated with ama	Factors associated with Metabolic Syndrome
Aharaj (Unhealthy Dietary Habits)	<ul style="list-style-type: none"> <li>Intake of Guru, sheet, sushka, ruksha, vidahi and viruddha anna</li> <li>Ajjernabhojan (in state of indigestion)</li> <li>Asatmyabhojan (unsuitable)</li> </ul>	<ul style="list-style-type: none"> <li>Excessive Intake of junk, stale and oily food.</li> </ul>
Viharaj (unwholesome Lifestyle)	<ul style="list-style-type: none"> <li>Sandharan (suppression of natural urges)</li> <li>Swapnaviparyaya (inadequate sleep habits)</li> <li>Atyambupaana (excessive water intake)</li> </ul>	<ul style="list-style-type: none"> <li>Sedentary Life Style</li> <li>Disturbed Sleep Routine</li> </ul>
Mansik (Pertaining to Emotion)	<ul style="list-style-type: none"> <li>Shok, chinta, manoglani (Depressive state of mind)</li> <li>Krodh (anger)</li> </ul>	<ul style="list-style-type: none"> <li>Anxiety, stress and depression</li> </ul>

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**Comparison of symptoms of Ama and Metabolic Syndrome;**

Symptoms associated with Ama	Symptoms associated with Metabolic Syndrome
Adhmana (Distension in abdomen)	Increase in the abdominal girth. (Central obesity).
Gaurava (heaviness)	Heaviness due to Obesity.
Alasya and Klama (Lethargy)	Unwillingness to work, fatigue.
atyadhika mutra nirharan (excess urine excretion)	Polyuria.
Sira Akunchana Stambha (hardening of blood vessel)	Atherosclerotic Changes.
Ajeerna (Indigestion)	Improper Digestion.
Balabhransha (weakness)	Lack of Strength.

**CONCLUSION**

In ayurveda, Mandagni leads to the formation of Ama which is described as an indigested particle by various Acharyas and due to its accumulation in the body, symptoms like srotorodha, gaurav, klama are observed. Ama itself act like a disease as well as a causative factor for several diseases. vitiated agni leads to Dhatvagnimandya i.e. impaired metabolic activity which leads to pathological conditions like obesity, diabetes, hypertension and dyslipidaemia. All these conditions in a group leads to the development of Metabolic syndrome which further raises the risk for cardiovascular diseases.

So, this impaired metabolism not only leads to the formation of ama but also induces the manifestation of Metabolic Syndrome and other metabolic ailments.

By adapting to simple preventing measures like opting a healthy dietary habits and life style, physiological fire (agni) can be maintained which will prevent the formation of ama and will help in the prevention of numerous metabolic illnesses.

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