

Metabolic Syndrome and Its Management Through Ayurveda and Yoga

Dr Jaspreet singh¹ Dr A.K.Pandey²

¹(Assistant Professor Department of Kayachikitsa (Ayurvedic medicine), Quadra Institute of Ayurveda and Hospital, Roorkee, Uttarakhand, India)

²(Associate Professor Department of Kayachikitsa, (Ayurvedic medicine), Faculty of Ayurveda, Institute of Medical Sciences, Banaras Hindu University, Varanasi, Uttar Pradesh, India)

Abstract:- An average 230 million peoples all over the world are suffering from metabolic disease. In the present scenario Metabolic Syndrome (MS) is increasing to an epidemic globally, which mainly consist of Hyperglycemia, Dyslipidemia and obesity. This MS can lead to life threatening major risk factors such as CAD, CKD and NAFLD etc. There is an urgent need to understand the complex etio-pathogenesis and to introduce an efficacious management of MS. The Ayurveda describe the two main concepts of diseases first one which is related to over-nutrition and second one related to under-nutrition. The disease MS is supposed to be the outcome of over nutrition due to defective tissue metabolism. Till now the management of MS is limited only up to the use of drugs that correct dyslipidemia, blood pressure and hyperglycemia. In this regard the Ayurveda based line of management with the help of diet, yoga, meditation and with the use of natural herbs, can establish a mile stone in the management of MS. The present work is an effort to understand the etio-pathogenesis of MS and to establish an effective line of management of MS in Ayurveda. It may also enlighten the path for future researchers on the same.

Keywords:- Dyslipidemia, Hyperglycemia, Insulin resistance, Metabolic Syndrome, obesity.

I. Introduction

In recent years MS is gaining too much importance by the physicians and researchers worldwide, because of its complex etio-pathogenesis, clinical presentation, management and major complications. The MS consists of various components which are result of defective metabolism and increases the risk of Coronary Artery diseases (CAD) and Diabetes Mellitus (DM) ⁽¹⁾. The pathogenesis of MS is complex but central obesity seems to be a key factor to develop MS. It is a major health hazard in the developed countries and gradually accruing its place in developing countries too, which leads to other hazardous complications such as CAD, CKD, NAFLD and PCOD etc ⁽²⁾. Initially MS was known as Syndrome X or Insulin Resistance syndrome ⁽³⁾. Syndrome X was the name proposed by Reaven (1988) in a lecture of the American Diabetes Association ⁽⁴⁾. According to Reaven, Syndrome X was a group of associated conditions that were important in the development of coronary artery disease and he included hyper-insulinemia, glucose intolerance, hyperglycemia, elevated low density lipoprotein cholesterol and hypertension in the syndrome..

In 1998 World Health Organization has introduced the original definition of MS ⁽⁵⁾. The main components of MS include an increased blood pressure, increased triglyceride levels, increased blood glucose levels, Central obesity and Decrease High density lipoprotein (HDL)⁽⁶⁾. The Metabolic syndrome is common in adult populations all over the world and the incidence of MS in the Indian subcontinent is increasing rapidly. The sedentary life style and unhealthy food habits contributes a lot in rising rates of obesity, which is a major contributor to develop MS ⁽⁷⁾. The prevalence and severity of obesity in children is rising Worldwide and it is an alarming and initiating feature of MS in younger population ⁽⁸⁾. The unhealthy and high caloric diet along with sedentary life style causes central obesity ⁽⁹⁾. The central obesity increases the risk of insulin resistance by the release of abundant FFA in the circulation which occupies insulin receptors and causes Pre diabetic or hyperglycemic state which in turn leads to metabolic syndrome ⁽¹⁰⁾. If this pre diabetic state or full pledged diabetic stage is ignored, condition of metabolic syndrome emerges ⁽¹¹⁾. Over a period of time if not cured this condition of MS may transform in to other major and hazardous cardio vascular and other complications ⁽¹²⁾. This transformation of this in to major and hazardous cardio vascular and other complications depends up on the degree of risk factors which are associated the clinical condition ⁽¹³⁾.

Thus the Metabolic syndrome provides many challenges to government and healthcare providers from birth to death. The recent data reflects that increased industrialization worldwide is associated with rising rates of obesity, which is anticipated to increase prevalence of the MS dramatically, especially as the population ages. Moreover the rising prevalence and severity of obesity in children is initiating feature of MS in younger population.

The purpose of the present work is to introduce an effective and safe Ayurveda based line of management of MS as well as to introduce other preventive measures such as yoga and meditation for metabolic syndrome and to prevent its life threatening major metabolic complications

II. Definition of Metabolic Syndrome

2.1 The National Cholesterol Education Program - Adult Treatment Panel III (NCEP-ATP III) in 2004 by the presence of 3 or more, out of these 5 criteria's-

- 1- Waist circumference >102 cm in males >88 cm in females
- 2- Hyper Triglyceridemia; Triglyceride >150 mg/dl or specific medication.
- 3- Low HDL cholesterol; <40 mg/dl in males <50 mg/dl in females or specific medication.
- 4- Hypertension; Blood pressure >130/85 mm/Hg or specific medication.
- 5- Fasting plasma glucose >100 mg/dl or specific medication or previously diagnosed Type 2 DM.

2.2 The International Diabetes Foundation (IDF) in 2005 has defined MS, by the presence of 2 or more, out of these 4 criteria's-

- 1-Fasting Triglyceride > 150 mg/dl or specific medication
- 2-HDL cholesterol <40 mg/dl in males <50 mg/dl in females or specific medication.
- 3-Blood pressure >130/85 mm/Hg or previous diagnosis or specific medication.
- 4-Fasting Plasma Glucose > 100mg/dl or previous diagnosed Type 2 DM or specific medication.

2.3 The American Heart Association (AHA) in 2005 has defined MS, by the presence of 3 or more, out of these 5 criteria's-

- 1- Waist circumference >102 cms.
- 2- Hyper Triglyceridemia; Triglyceride >150 mg/dl or specific medication.
- 3- Low HDL cholesterol; <40 mg/dl or specific medication.
- 4- Hypertension; Blood pressure >130/85 mm/Hg or specific medication.
- 5- Fasting plasma glucose >100 mg/dl or specific medication.

2.4 The American Association of Clinical Endocrinologists (AACE) in 2003 has defined MS, by the presence- Impaired Fasting Glucose i.e. IFG (FBS 110-126mg/dl), Impaired Glucose Tolerance i.e. IGT (PPBS >140-199 mg/dl) + 2 out of these criteria's-

- 1- BMI >25 Kg/m²
- 2- Hyper Triglyceridemia; Triglyceride >150 mg/dl or specific medication.
- 3- Low HDL cholesterol; <40 mg/dl or specific medication.
- 4- Hypertension; Blood pressure >130/85 mm/Hg or specific medication.

2.5 The European Group for the study of Insulin Resistance (EGIR) in 1999 has defined MS, by the presence- Insulin Resistance or Hyperinsulinemia + 2 or More of these criteria's-

- 1- Waist circumference >90 cm in males
>80 cm in females
- 2- Hyper Triglyceridemia; Triglyceride >175 mg/dl or specific medication.
- 3- Low HDL cholesterol; <40 mg/dl or specific medication.
- 4- Hypertension; Blood pressure >140/90 mm/Hg or specific medication.
- 5- Fasting plasma glucose >110 mg/dl or specific medication.

2.6 The World Health Organization (WHO) in 1998 has defined MS, by the presence of- Diabetes Mellitus or Impaired Glucose Tolerance i.e. IGT (PPBS >140-199 mg/dl) or Insulin Resistance + 2 or More of these criteria's-

1. BMI >30 Kg/m² or Waist Hip ratio >0.90 in males
>0.85 in females
- 2- Hyper Triglyceridemia; Triglyceride >150 mg/dl or specific medication.
- 3- Low HDL cholesterol; <35 mg/dl in males
< 39 mg/dl in females or specific medication.
- 4- Hypertension; Blood pressure >140/90 mm/Hg or specific medication.
- 5- Urinary Albumin excretion > 20 µg/min

III. AYURVEDIC CONCEPT OF MS

The classical *Ayurvedic* texts have vividly described *Santarpanjanya Vikaras* (Comprise of diseases due to over nutrition and defective tissue metabolism). *Ayurveda* mainly focus upon conservation of health rather than disease eradication. It presumes that improper dietary habits and deranged functions of different sets of Agni (Metabolic fire) give rise to formation of *Ama* (reactive antigenic factor). Since last few decades, the conventional system of medicine is focusing on the concept of metabolic syndrome, which seems very similar to the concept of *Santarpanjanya Vikaras* of *Ayurveda*.

Various factors in the body cause disturbances in the production of *Medadhātu* (Lipids) prime of them are *Medodhatvagni* (Lipid metabolic process). In this whole process the quantity (amount and proportion) and quality (contents) of *Medadhātu* (Lipids) are also disturbed by the same. When *Medadhātu* (Lipids) interacts with preformed form of *Ama* (reactive antigenic factor), it changes and alters the quality and quantity of fatty tissues including cholesterol. The interaction of *Ama* (reactive antigenic factor) with fatty tissues is known as *Sama Medadhātu* (unhealthy and bad lipids). This form of *Ama* (reactive antigenic factor), when circulates all over the body may lead to blockade of micro-channels and precipitate antigenic reactions and generate series of inflammatory events in the body. If such categories of *Ama* (reactive antigenic factor) interact with *Medadhātu* (Lipids), it may lead to a variety of metabolic disorders.

3.1 Samprapti ghataka (Pathological factors) of Metabolic Syndrome

3.1.1 Doaa - It is a *kapha* predominant *vyadhi* but involvement of *vata* and *pitta* cannot be neglected. So, collaboration of three *Doaas* propagates the process of pathogenesis of MS.

Kapha- It plays an important role at the time of accumulation of *Amadosa*. Most of the symptoms of MS come under the category of *Kaphavyadhi* i.e. Central obesity, Hyperglycemia and Dyslipidemia etc.

Pitta- In the patients of MS, *pittaja lakshanas* are very less but most of them have *Tikshagni*. *Srotosanga* due to *medovridhi* and potentiate *Samana Vayu* to stimulate the *jatharagni* so, most of the persons have good appetite. It plays role in the stage of vitiation and localization of *Ama dosas*.

Vata- *Vata* can create two situations in the body.

1. The state of *Avrita Vata* which provokes the *Agni* and ultimately increasing the demand for the food (*Abhyavaharana shakti*) and absorbs the nutrients.

2- Inactiveness of *Vyana vayu*. *Vyana vayu* is responsible for proper circulation and distribution of *Dhatu*s.

Due to, *Sanga* in *srotasa*, the nutrients cannot be carried by *Vyana vayu* to their respective *Dhatu*s. Hence, involvement of *Samana vayu* can be clearly postulated with the evidence of *Agni sandhuksana* and improper distribution of fat in the body proves the involvement of *Vyana vayu*.

3.1.2 Dusya - Without *Dosadusya sammurchchhana* disease process is not possible. In the pathogenesis of MS, the excessive production of abnormal *Medadhātu* (Visceral adipose tissue) occurs, which ultimately leads to Insulin resistance, Hyperglycemia and Atherosclerotic changes etc. *Rasa*, *Rakta Mamsa*, *Meda*, *Majja* and *sukra dhatu* are to be seen *Dusya* in MS. Among these *Rasa*, *Mamsa* and *Meda* are the *pradhana Dusya* in the pathogenesis of MS.

3.1.3 Agni - Due to *Dhatvagni mandata* there is excessive formation of Abnormal Visceral adipose tissue. Which causes release of excess FFA, which mimics insulin molecule and causes Insulin resistance by downstream regulation of the insulin receptors.

3.1.4 Srotasa - In MS, the main *srotasa* involved are *Rasavaha*, *Raktavaha*, *Mamsavaha* and *Medovaha srotasa* along with the involvement of other *Srotasa*. The *srotasadusti* in *Rasavaha*, *Mamsavaha* and *Medovaha srotasa* plays key role in the pathogenesis of MS.

Avyayama, excessive intake of *Madhura Dravya* and sedentary life styles are vitiating factors for *Medovaha srotasadusti* as mentioned in *Caraka Samhita*. It indicates the clear involvement of *Medovaha Srotasa* along with *Rasavaha Srotasa*. *Atisveda* and *Daurgandhya* indicate the involvement of *svedavaha srotasa*. Presence of *Atipipasa* indicates the involvement of *Udakavaha srotasa*. In the pathogenesis of MS, increased fat deposition inside the muscle (*vasa*) indicates the involvement of *Mamsavaha Srotasa*.

3.1.5 Srotodusti - In the pathogenesis of MS, *Srotosanga* and *Vimarga gamana* are initial defect in *Srotasa* followed by *Atipravritti*.

3.1.6 Udbhava sthana - *Amasayottha vyadhi*

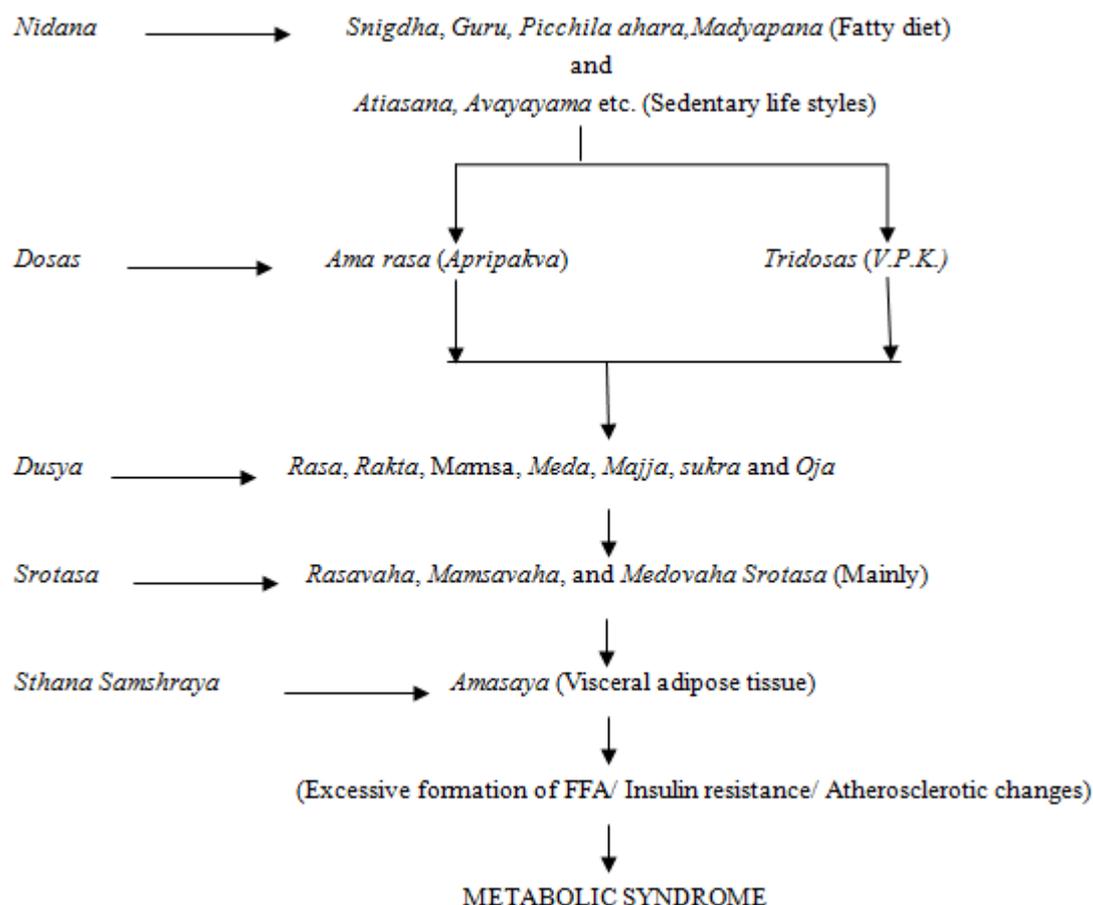
3.1.7 Vyakta sthana - *Udara, Spika, stana* and *Gala pradesa*

3.1.8 Sanchar sthana - *Sarvasarira* by *Rasa* and *Raktavaha srotasa*

3.1.9 Svabhava - *Chirkari*

3.1.10 Sadhyasadhya - *Krichha sadhya vyadhi*

IV. Flow Diagram Of Pathogenesis Of Ms



V. Ayurvedic Approach to the Management Of Ms

Samshodhana (Eliminative therapy) and *Samshamana* (Palliative therapy) therapy are the important therapeutic measures described in *Ayurveda* for the management of various diseases. In which *Samshodhana* measures hits the root cause of disease. Under *Samshodhana* therapy, Procedures like *Mridu Virecana* (light purgation), *Shodhana Vasti* (medicated enema) and *Ruksha udvartana* (gentle rubbing of skin with dry substances) may be found clinically effective in cases of MS. *Vamana* (induced vomiting by use of ayurveda drugs) therapy can be planned with caution in case of MS.

Under pacificatory measures the below described guidelines may be helpful in preventing and treating the cases of Metabolic Syndrome-

5.1 *Nidana parivarjana* (Root cause elimination) - *Nidana parivarjana* is "To avoid the risk factors". *Nidana parivarjana* is considered as the main therapy in the management of various diseases as described in *Ayurveda*.

Excess intake of carbohydrate and fat leads to abnormal visceral adiposity, which initiates cytokines-mediated pro-inflammatory process and causes excess formation of FFAs, which occupies the insulin receptors and in turn leads to Insulin resistance and other defective metabolism. Hence, *Snigdha* (oily), *Guru* (heavy), *Pichhila* (unctuous) *Ahara*, *Madyapana* (alcohol intake) as well as *Atiasan* (over eating behaviour), *Avayayam* (Sedentary life styles) etc. Should be avoided by the patients of metabolic syndrome.

5.2 *Yoga and Asana* - According to medical scientist's yoga therapy is successful because of the balance created in the nervous and endocrine system which directly influences all systems and organs of the body.

Yogasans have often been thought of as a form of exercise. They are not exercises, but techniques which place the physical body in position that cultivate awareness, relaxation, concentration and meditation. Important *Yogasans* are *Dhanurasana*, *Halasana*, *Matsyasana*, *Yogamudrasana*, *Utkatasana*, *Vajrasana*, *Siddha yoniasana*, *Padasana*, *Makarasana*, *shavasana*, *Pavanamuktasana*, *Padotthanasana*.

5.3 *Meditative Exercise* - In this regards *Yogasana*, *pranayama*, such as *Anuloma-Viloma*, *Bhastrika*, *Kapalabhati* and *Trataka* are helpful to check the mental stressors. But these should be advice only after evaluating cardiac functions of the patients.

5.4 *Agni Promoting (Drugs correcting metabolic process) drugs* - such as *Chitrakadi Vati*, *Trikatu Churna*, and *Pippali Churna* etc.

5.5 *Ojas Promoting (Immunity enhancer) drugs* - such as *Guduci*, *Amalaki*, *Haridra*, and *Silajatu* etc.

5.6 Compound formulations– Important compound preparations such as- *Puskarabramhi guggulu*, *Medohara guggulu*, *Punarnavadi guggulu*, *Triphaladi guggulu*, *Nisamlaki Churna*, *Amritadi guggulu* and *Sapragandha ghanavati* are found to be helpful.

5.7 Single drug – Like

Puukaramula (*Inula racemosa*)^(14, 15)

Guggulu (*Commiphora mukul*)⁽¹⁶⁾

Kustha (*Saussurea lappa*)⁽¹⁷⁾

Meshshringi (*Gymnema sylvestre*)⁽¹⁸⁾

Vrikshamla (*Garcinia indica*)

Rasona (*Allium sativum*)⁽¹⁹⁾

Sunthi (*Zingiber officinale*)

Haridra (*Curcuma longa*)

Arjuna (*Terminalia arjuna*)⁽²⁰⁾

Guduchi (*Tinospora cardifolia*)⁽²¹⁾

Amla (*Embllica officinalis*)⁽²²⁾

VI. Conclusion

The present research work has been undertaken with aims to laid down scientific overview on Metabolic syndrome as per conventional and *Ayurvedic* parlance. Beside this, it also aims to introduce an *Ayurveda* based line of management in the cases of metabolic syndrome. The conventional review reveals that medical men knew the clinical entity of metabolic syndrome since last decades. The incidence of MS is alarmingly increasing in developed as well as developing countries including India. The observed fact is that the exact mechanism of complex pathways of MS is not yet completely known but high calorie diet, faulty lifestyle, stressors, central obesity, endocrine disorders, aging along with genetic factors contribute a lot in the path physiology of MS. It is believed that adipocytes of visceral fat increases plasma level of TNF-alpha and alters the level of others substances (adiponectin, leptin, resistin, PAI-1 etc) which plays a series of event of chronic inflammation that may lead to increased risk of developing hypertension, atherosclerosis, diabetes. The emerging concept of MS is strikingly resemblance with over-nutritional (*Santarpanjanya Vikaras*) disorders, which include *Sthulya/Medoroga* (Obesity/Dyslipidemia), *Prameha* (Diabetes), *Hridroga* (Cardiac diseases) of *Ayurveda*. Thus on the basis of present research work, it can be concluded that Metabolic syndrome is well defined and still evolving etiopathogenesis in biomedical sciences is as such not described in *Ayurvedic* classics, but it may be considered as the *Meda* (Lipids) dominant disorder have strong resemblance with *Prameha* (Diabetes) and *sthulya/Medoroga* (Obesity/Dyslipidemia). The conventional management of metabolic syndrome is still not very satisfactory and the current strategy of prevention and treatment of metabolic syndrome is rapidly changing. Hence many investigators in this field are inclined to undertake scientific study in treatment development from *Ayurvedic* resources.

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