IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

Dietary Changes and the Metabolic Syndrome:

T.VASANTHI Ph. D Scholar , Professor: Dr .M.ARUNA, Head of the Department of Home Science,

Sri Padmavati Mahila Visvavidyalayam, Tirupati, A.P.

Abstract:

The Metabolic syndrome is increasing globally. The clustering of risk factors, leading to cardiovascular disease and T2DM, which are of metabolic origin.

Recently the International Diabetic Federation (IDF) provided worldwide definition for MS which considers central obesity and insulin resistance as important factors. IDF group further highlighted pro-inflammatory state as a (major factor) main initiator of the syndrome. In the context of globalization of food systems, people's diet pattern shifted to more processed food and ready to eat convenient food instead of minimally processed, plant based food. According to the recent studies on processed food suggests that higher intake of these foods are directly associated with Overweight/ Obesity and MS; highlighting the dietary role in modulating the risk of metabolic syndrome risk factors.

Till now, we are treating each condition of metabolic syndrome risk factors separately; instead of implementing therapies that reduce all the risk factors simultaneously. From recent research it is clear that dietary changes approach which target all of the risk factors and targeting the striking underlying causes of obesity and Insulin resistance will be the first step in the management of Metabolic Syndrome.

(Key words: metabolic syndrome, processed food, central obesity).

Introduction:

Metabolic syndrome (MS) is clustering disorder increasing worldwide. MS is defined as a complex of inter connected factors leading to coronary, heart disease, vascular disease and diabetic mellitus or Type-2 diabetes. It's main element are dyslipidemia (Elevated Triglycerides) , ↓HDL, elevated blood pressure, imbalance in glucose homeostasis, central obesity (increased waistline) and insulin resistance are the major manifestation of the MS. According to Grundy and Zimmet (2005) research, " it is well accepted that the metabolic syndrome increases the risk factor for the development of CVD, T2DM stroke and cancer.

From the past few years, several expert groups have attempted to set forth simple diagnostic criteria to be used for clinical practice to identify MS. These criteria varied in specific elements. Recently, the International diabetic foundation (IDF) published new criteria for MS clinical definition that the presence of abdominal obesity is essential for diagnosis. They considered the abdominal obesity is so highly correlated with insulin resistance and more laborious measures of insulin resistance are unnecessary.

Table :1 IDF(INTERNATIONAL DIABETES FEDERATION) Worldwide definition for Metabolic Syndrome:
CENTRAL OBESITY:
Waist Circumference - ethnicity specific.
Plus any two of the following:
Raised Triglycerides:
Greater than or equal to 150mg/dl or on medication.
Reduced HDL levels:
Less than 40mg/dl in males
Less than 50mg/dl in females or on medication.
Raised Blood Pressure:
Systolic: greater than 130 mmHg
Diastolic: greater than 85 mmHg or on medication
Raised Fasting Plasma Glucose :
Fasting Plasma Glucose: greater than 100mg/dl or previously diagnosed type 2 Diabetes.

Table :2 Ethnic specific cut points for Waist Circumference:

Ethnic group	Waist circumference(as measured of central obesity)
Euripides	Male ≥94 cm, Female ≥ 80cm
South Asians	Male ≥90 cm, Female ≥ 80cm
Chinese	Male ≥90 cm, Female ≥ 80cm
Japanese	Male ≥85 cm, Female ≥ 90cm

Ref: Alberti G, Zimmet et al,2004, IDF,2005

Nesto (2003) and others researched findings also confirms the same as Central Obesity and insulin resistance as important causative factors. Individuals with these factors manifest a prothrombotic state and pro-inflammatory condition. Initially, MS was referred as if a discrete entity with single cause, yet , available research data suggest that it has more than on cause. The main causes according to research are abdominal obesity, insulin resistance, Physical inactivity, aging, hormonal imbalance and atherogenic diet can enhance risk for developing CVD. Although the diet is not listed specifically as an underlying risk factors for the condition. (NCEP(ATP-III)(2002).

Most recent research highlighting the potential role of diet on modulating risk of obesity and Metabolic Syndrome. According to Baker & Friel (2014) “The increasing globalization of food systems, the theory of the nutrition transition suggests that with economic development the population consumption pattern shifted from minimally processed diet rich in plant based staple to diets high in meat, fats and processed foods”.

The wide spread availability of highly processed foods, which are rich in fructose than glucose are more contributing factor for damage and MS risk factors. This is strengthened by recent research studies on animals and humans. For a point of view studies by Barnard et al (1992, 1993,1994) have documented that “ diet appears to be a major factor in the metabolic syndrome and have shown that the syndrome can be induced in rats by feeding an high fat- refined sugar diet similar to the typical US-diet and can be controlled in humans by feeding a low fat complex carbohydrates diet” He also observed that within 2 weeks consumption high fat refined sugar diet, the animals were hyper insulinemic and demonstrated skeletal muscle insulin resistance by reduction in glucose transport, but there was no change in triglycerides, blood glucose levels, blood pressure and no indication of obesity. He also noted that “ at 2 months , 6 months & 2 years plasma insulin was further increased (than @ 2 week(abdominal fat cells were enlarged, significantly elevated triglycerides and hyper tension.)

One more study on baboons provides great in sight on potential role of diet on metabolic syndrome. In this, four test groups of baboons were fed on different proportions of starch, glucose, fructose and sucrose, supplemented with appropriate amounts of other dietary requirements. All the groups showed elevated triglycerides. Starch & Glucose fed groups showed 37% increase and 65% in fructose fed groups. They also showed the development of fatty streaks in the aorta & this development was greatest in fructose fed group. (Kritchevsky ,1974).

The experimental studies (Steohanie seneff etal,2011,Lopez et al 2015))(proves the adverse Metabolic effects of fructose when compare with glucose. Fructose is converted to lipid in the liver leading to (Fatty liver) development of high triglycerides, Low HDL levels, small , dense LDL & insulin resistance. Further studies on refined & processed foods, observed that protein glycation ; which are impaired in function and susceptible to more oxidation damage leading to pro inflammatory condition in the body.(Bray,2007,Vasanti et al,2010)

These glycated proteins accumulates in the blood serum and arterial walls leads to aging , athero sclerosis and issue related to diabetes(Person,1988). More recent study on the consumption of minimally processed , processed and ultra processed foods in a sample of Labanese adults showed that higher adherence to the minimally processed /Diet pattern decreased odds of hyperglycaemia, triglycerides and MS risk factors(Tavares et al 2012, Louzada et al,2015,Lara,2017). Few more studies on ultra processed food also confirms the same effect of minimally processed foods, which are retaining their nutritional beneficial properties of phytochemicals, antioxidants, fiber and mono unsaturated fats which reduce the oxidative stress , inflammatory response, insulin fluctuations and MS risk factors.(Canella et al,2008-2009; Moubrance et al 2014;Martin et al 2013; Juul and Harmming son ,2015;Anderson et al,2009).

In summary , (Research on) short- term & long term experiments on animals and human beings it is clear that a diet rich in processed food is the underlying factor responsible for MS risk factors. Even 2 weeks of short time on this diet leading to skeletal muscles insulin resistance. From these findings Dietary changes will be the first approach in the treatment and management of MS rather than treating each condition separately with pharmacological drugs initially.

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