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REVIEW ARTICLE

Metabolic syndrome, a prelude to type 2 Diabetes Mellitus and other complications of Public Health in Mexico and Globally

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Manuscript Info Abstract

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Metabolic syndrome represents the prelude to type 2 Diabetes Mellitus, and cardiovascular effect, Mexico ranks first in Obesity, same including the metabolic syndrome (MS), this causes information to flow emerging on its definition, the criteria for identification, the risks that are commonly associated and some prevention strategies, including those aimed at mitigating the effect of this syndrome to the increase in non-communicable chronic diseases, so it is important the development of this article with the aim of describe the current state of (MS), with the vision of putting a Mexican public warning, without exempting the world population.

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Introduction

Some years before he was known by the name of MS, some investigators described in different ways, this association of functional and structural metabolic disorders presenting with greater frequency than would be expected by chance alone. This is what English-speaking authors called a cluster or association of elements.¹

Since the Framingham study researchers found that obesity, type 2 diabetes, hypertension, hypercholesterolemia and hyperuricemia were traits that were presented frequently associated, and increased significantly the risk of coronary atherosclerosis.

From the last decades of the twentieth century, CVD have been identified as major causes of morbidity and mortality worldwide, and is now seen not only in the developed world but also as high incidence of disease in the developing world.

Over time it has given greater priority to the identification of different risk factors for the development of these diseases, including mainly observed obesity, dyslipidemia, type 2 diabetes mellitus, and hypertension, however by making an analysis of the pathophysiological environment found common features for each of these conditions: especially insulin resistance, which was described in 1988 by Reave who proposed this partnership with semiotic true meaning by expressing essential components or disorders that initially were only hyperglycemia, triglycerides, high-density lipoprotein (HDL) and hypertension, united by a common pathophysiological link, deposit resistance to insulin-mediated glucose in skeletal muscle and insulin resistance.

After this description continued different studies to determine what is leading to the development of these alterations, and likewise to the definition of the disease, the term MS is the globally accepted.^{2, 3}

During the last decade, CVD mortality has increased dramatically, and this has been linked more in patients with risk factors already identified, which have now been collected by various agencies worldwide and thus have established several diagnostic classifications through which it seeks to identify early those patients who are at increased risk of developing CVD. Initial diagnosis being MS entity that has been the association of various clinical and biochemical abnormalities. Has been associated with polycystic ovary syndrome, nonalcoholic fatty liver, some forms of cancer and sleep apnea.^{4,5}

Therefore have been proposing various definitions thereof allowing clinically recognize. The currently most used are the WHO and NCEPATPIII, although the first was proposed as a working definition to study and understand the SM and the second was proposed as a way to identify individuals with an increased coronary risk, no cover achieved in practice yet full and equal the major components of the syndrome. The definitions of MS have been applied in multiple populations, allowing comparison between countries, ethnic groups and in conditions as diverse as renal transplantation or HIV. The definition of the International Diabetes Federation (IDF) recommended for Asians and Latinos, the WHO criteria was limited to European populations.

Definition of metabolic syndrome

Marañón in 1922, Kylin 1923, Himsworth 1936, Vague 1956, 1964 and Avogaro Albrici 1966, were the forerunners of the study and research of metabolic syndrome (MS) or syndrome X.⁶

Yallow and Berson in 1970 defined the insulin resistance as a state of the cell, tissue, system or the entire body which require greater amounts of insulin to produce a normal response to glucose utilization; also be said that this is a decrease in circulating glucose in response to insulin administered. The (WHO) and the National Cholesterol Education, version 2001, preferred to call Metabolic Syndrome.⁷

A syndrome is a set of symptoms and signs which are generally grouped together to define a clinical or disease. The SM was recognized as such in 1988 by Reaven, this author called it Syndrome X or insulin resistance in obese arterial hypertension, and reported that the adult population suffers no obese hypertensive hyperinsulinemia and that their situations should be considered a state of pre-obesity.

Recently meta group of experts convened by the IDF and WHO, with participation of representatives of the ATP III, European Group for the Study of Insulin Resistance (EGIR) and the scientific community in different regions of the world, to develop a globally accepted definition and make recommendations on various aspects such as treatment, This definition makes clear that the SM should revolve around the presence of abdominal obesity/visceral and therefore became necessary to standardize the measurement of waist circumference as the easiest and most reliable way to diagnose this type of obesity clinical practice. The cutoff point of waist circumference varies between men and women and between different ethnic groups, so be standardized regionally.

It is understood that the excess accumulation of intra-abdominal fat in the region known as abdominal or visceral obesity, tends to be associated with increased insulin resistance and is a better predictor for the development of cardiovascular disease, type 2 Diabetes Mellitus, dyslipidemia, impaired carbohydrate and hyperinsulinemia compared to the amount of adipose tissue determined by the total body mass index (BMI).

It is known that chronic diseases are a major public health challenge of the XXI century, as well as which are the leading causes of death worldwide, with devastating impact by large losses in years of healthy life, quality of life, disability and economic costs, social and family.

Risk factors differently involved in the atherogenic process an thrombosis, which are classified into predisposing factors, causal and conditional, but regardless of this classification.

Metabolic syndrome etiology (MS)

In this syndrome, the genetic factors important and is expressed from the early stages of life. When matched genetic predisposition with environmental factors can trigger the disease (excessive intake and lack of physical exercise).⁸ Vazquez matches that excess food, is what leads to such diseases where insulin

resistance is developed by a diet high in saturated fat, sedentary lifestyle and obesity, which eventually lead to beta cell exhaustion and consequently appears glucose intolerance, dyslipidemia and hypertension.⁹

This MS is observed in populations that do not have a shortage of food, lack of physical activity and a clear genetic predisposition. It is even more common in patients who migrate from rural to urban areas or nations that have undergone processes of "Westernization". People with MS accumulate fat in the center of the abdomen and are often obese. Over time appear hypertension, hyperuricemia, hypertriglyceridemia, low levels of HDL-cholesterol, glucose intolerance, fatty liver and chronic anovulation. Its late complications are the DM-2 and atherosclerosis. Manifested as cardiovascular death.

Epidemiology of metabolic syndrome (MS)

The prevalence of MS in the population varies widely depending on the definition used, the ethnic group of the study population, sex and age distribution. According to preliminary data from the National Health and Nutrition (ENSANUT) 2012, DM 2, still have a high prevalence.

While not yet known prevalence of metabolic syndrome ENSANUT, 2012, remember that previous figures ENSANUT 2006, indicated a prevalence of up to 50% of the population has MS according to the criteria of the International Diabetes Federation (IDF). Given the current data from 2012, will not change and there may be an increase, which include populations not only adults but also teenagers and children.

The prevalence of MS is associated with intra-abdominal fat deposition. At the clinic, the most practical method for measuring intra-abdominal fat is to measure waist circumference. Acknowledging this fat as the most important factor for CVD and type 2 Diabetes Mellitus.

In Mexico, the prevalence of cardiovascular risk factors has an upward trend, the problem is exacerbated because even though the predominant age group is adults, lately is presenting at younger ages, including children seven to twelve years of age and older. The adjusted prevalence of DM, hypertension (HTN) and SM in Mexico is higher than the U.S. population. Hypercholesterolemia is smaller but hypertriglyceridemia and low levels of cholesterol, high density lipoprotein (HDL-C) are higher.

In population over 20 years the prevalence of type 2 Diabetes Mellitus is 10.7 which represents 6.8 million have the disease, of which 47.2% had hypertension, 13.5% present with proteinuria.

Altering abnormal capillary glucose is 12.7% (110-126 mg) of the total population prevalence of hypertension and diabetes are directly related to age, body mass index and waist circumference. Patients with type 2 diabetes mellitus, have two to four times greater risk of mortality due to coronary artery disease, when set atherosclerotic heart disease risk increases four to seven times, contributing up to 70% of mortality in patients with T2DM.

The reduction in life expectancy of the patients is 8-10 years in the age range 40 to 70 years old.

The influence of type 2 Diabetes Mellitus and hypertension is bidirectional, being hypertensive is a risk of being diabetic twice. Furthermore, the risk of hypertension is 1.6 times higher when holder with diabetes. The ENSANUT, 2012 identifies that the challenge in the care and control of chronic conditions holds, while progress is between 2006 and 2012. According to the results of the survey, it is estimated that in Mexico there are 22.4 million adults 20 years of age or older with high blood pressure, of which only 11.2 million have been diagnosed by a doctor.

In obesity, whereas a BMI > 30 kg/m², the prevalence is 24.4%, of these 46.8% reported hypertension at the time of the survey. While the prevalence of hypertension in the obese populations 24.6%. This represents a 2.6 times greater risk of being hypertensive in the presence of obesity.

Dyslipidemia

The national average serum lipid levels is 182.7 mg/dL for total cholesterol to low-density cholesterol (LDL-C), 116.6 mg/dL, high-density cholesterol (HDL-C), 38.5 mg/dL and triglycerides 158.2 mg/dL.

Alteration is predominantly C-HDL considering a cutoff < 35 mg/dL, the prevalence by gender are 58.8% for males and 40.8% for women.

High cholesterol (> 200 mg / dL) occur in 30% of men and 25% of women. The triglycerides (> 200 mg / dL) occurs in 31.9% of men in 18.8% of women. Obesity, hypertension and dyslipidemia were the most common, again shown that when a woman reaches menopause age prevalence of chronic excess man.

The consumption of resources for any health system is devastating and is considered the pandemic of the new millennium. Every time you start any of these, it automatically becomes a greater risk to have other chronic diseases essential.

This has made recently to resume the SM as a crucial entity in the understanding and treatment of these diseases, because the deal only an alteration does not solve the problem of cardiovascular risk.

From these results, there is the warning about the urgent need to strengthen and implement national strategies to contain this important public health problem.

Strategies should be oriented towards an integrated approach of SM. This scenario warning about the urgent need to strengthen and implement national strategies to contain this important public health issue, taking into consideration that there is a great opportunity to limit late complications and target organ damage if evolved in a timely manner.¹⁰

Criteria for diagnosis of metabolic syndrome.^{13,20}

Metabolic syndrome criteria in accordance with who (World Health Organization)

Insulin resistance, defined by one or more of the following criteria:

Diabetes type 2

Impaired glucose fasting

Impaired glucose tolerance

Insulin resistance for HOMA

more of two of following criteria:

Antihypertensive treatment and / or high blood pressure > 140 mmHg systolic and 90 mmHg diastolic (modified)

plasma triglycerides > 150 mg / dL (> 1.7 mmol / L)

HDL-35 mg / dL (or 0.9 mmol / L) in men or 39 mg / dl (-1.0 mmol / L) in women

body mass index > 30 kg/m² and / or index waist / hip +0.9 in men and 0.85 in women

Urinary albumin excretion \square > 20 mcg / min or albumin / creatinine > 30 mg / dl

Diagnostics: abnormal fasting blood glucose, impaired glucose tolerance, diabetes or insulin resistance or more of two

Clinical identification of metabolic syndrome (ATP III)

At least three of the following aspects should be taken into account for the diagnosis.

Risk Factor	Defining Level
Abdominal obesity:	Waist circumference
Men	>102 cm (> 40 pulg)
Women	>88 cm (>35 pulg)
Triglycerides	> 150 mg/dl
HDL cholesterol	<40 men <40 Women
Men	>40 mg/dL
Women	>50 mg/dL
Blood pressure	>130/85 mmHg
Glucose	>110 mg/dL

Criteria of EGIR (European Group for the Study of Insulin Resistance) for metabolic syndrome

Insulin resistance defined by insulin > 75th percentile and at least two of the following criteria:	
Fasting plasma glucose	> 110 mg / dL (excluding diabetics)
Blood pressure	>140/90 mmHg or treatment for hypertension
Triglicérides	> 75 mg / dL or HDL-C <39 mg / dL in men and women or treatment for dyslipidemia
Waist circumference	> 94 cm men and women > 80cm
Diagnostic criteria of the International Diabetes Federation (IDF)	
CENTRAL OBESITY MEASURE FOR PERIMETER WAIST BY ETHNICITY	
More than two of the following factors:	
High triglycerides or receive treatment for this lipid abnormality of	> 150 mg / dL or 1.7 mmol / L)
Decreased levels of HDL cholesterol, or specific treatment for this disorder	(<40 mg/dL-1.0 mmol / L)
Blood pressure	>130/85 mmHg or antihypertensive treatment
Fasting serum glucose	>100gh/dL (5.6 mmol/L or previously diagnosed type 2 diabetes

The new International Diabetes Federation (IDF) definition

According to the new IDF definition, for a person to be defined as having the metabolic syndrome they must have:

- **Raised TG level: ≥ 150 mg/dL (1.7 mmol/L), or specific treatment for this lipid abnormality**
 - **Reduced HDL cholesterol: < 40 mg/dL (1.03 mmol/L*) in males and < 50 mg/dL (1.29 mmol/L*) in females, or specific treatment for this lipid abnormality**
 - **Raised blood pressure: systolic BP ≥ 130 or diastolic BP ≥ 85 mm Hg, or treatment of previously diagnosed hypertension**
 - **Raised fasting plasma glucose (FPG) ≥ 100 mg/dL (5.6 mmol/L), or previously diagnosed type 2 diabetes**
- If above 5.6 mmol/L or 100 mg/dL, OGTT is strongly recommended but is not necessary to define presence of the syndrome.**

* These values have been updated from those originally presented to ensure consistency with ATP III cut points

Central obesity (defined as waist circumference ≥ 94 cm for Europid men and ≥ 80 cm for Europid women, with ethnicity specific values for other groups) plus any two of the following four factors:

European	Men	>94 cm
	Women	>80 cm
USA	Men	>102 cm
	Women	>88 cm
South Asia (China, Malaysia, India)	Men	>90 cm
	Women	>80 cm
China	Men	>90 cm
	Women	>80 cm
Japan	Men	>85 cm
	Women	>90 cm
Central and South America	Use the recommendation Asian, more studies are needed	
Saharan Africa	Using European data	
Eastern Mediterranean and Middle East	Using European data	

ADDITIONAL DIAGNOSTIC CRITERIA PROPOSED BY THE IDF (International Diabetes Federation)

Distribución anormal de la grasa corporal	General distribution of body fat (DEXA)
	Central fat distribution
	Adipose tissue biomarkers (leptin, adiponectin)
	Fat content of liver
Dyslipidemia and atherogenesis	Apo B
	Small particle LDL
Dysglycemia	Curve glucose tolerance
Insulin resistance	Fasting levels of insulin and proinsulin
	Indice HOMA
	Insulin resistance by the minimal model by Bergman
	Elevated free fatty acids (fasting and after meals)
	Glucose-insulin clamp
Impaired vascular regulation	Measurement of endothelial dysfunction
	Microalbuminuria
proinflammatory state	Serum C-reactive protein
	Elevated levels of inflammatory cytokines
	Decreased serum levels of adiponectin
prothrombotic state	fibrinolytic factors
	Clotting Factors
hormonal factors	Pituitary-adrenal axi

AHA/NHLBI American Heart Association / National Heart, Lung, and Blood Institute.

blood pressure:	>130 mmHg systolic or >130/85 mmHg diastolic or antihypertensive treatment, patients diagnosed with hypertension
Elevated triglycerides:	>150 mg / dL or 1.7 mmol / L or treatment for hypertriglyceridemia: Decreased HDL <40 mg / dl or 0.9 mmol / L in men <50 mg / dL or 1.1 mmol / L in women
Waist circumference:	Men<102 cm Women>88 cm
Elevated fasting glucose:	>100 mg / dL or hypoglycemic treatment

Discussion.

The key to addressing the pandemic that is the metabolic syndrome (MS), lies in a better understanding of the diagnosis and early treatment. While there is still no comprehensive treatment as has been demonstrated that changes in lifestyle (diet and exercise), form the basic strategy of treatment.

There is now a growing number of new therapies that could treat various risk factors simultaneously and this could have a significant impact on reducing morbidity and mortality.^{11, 12}

Despite this, should not be ignored risks associated with the use of various drugs, which are usually class specific, so the problem must be treated holistically, with participation in the treatment of a multidisciplinary team of professionals, including to professional in Clinical Nutrition, the Doctor, the Physical Activator, and Psychologist.

So addressing conduct Ural appearance, physical, nutritional and psychological. Carefully assess the risk-benefit for the specific treatment and try to achieve a level of disease control that reduces the risk of morbidity and mortality and at the same time decrease the adverse effects by strict control and proper monitoring.^{13, 14}

Pharmacological treatment of metabolic syndrome, can be divided into broad groups, depending on the existing disease entity thus can consider each of the components separately, but putting together the combined actions in each of them, so it deem useful drug groups in each of the components.¹⁵⁻²¹

Conclusions.

For the realization of individualized eating plan is necessary take into account the following points: economic Arrangement, physical arrangement of food, genetic pathological predisposition, current pathology, type of drugs that have prescribed, the patient has surgery, food intolerance allergies, tastes, habits, customs, time to take the food, the time devoted to physical activity, weight, current weight, target weight, dry weight, percent fat mass, height, body mass index, waist circumference, blood pressure, laboratory results among others. The plan individualized eating and plan exercise lowers blood sugar levels, decreases the percentage of fat mass, helps reduce waist circumference, lowers levels of systolic and diastolic blood pressure, helps to raise high-density lipoprotein and low density decrease.

The strategies required to improve the health status lie in the contextual intervention from tasks or activities guide public health lifestyles of the population, in Mexico as in other countries this issue is urgent interest rather than an increase in the cases of diabetes costs of increase, spending on health institutions and family. Public health strategies will have to be implemented from education to health, but this in turn constructivist pedagogical models and this requires teacher training guide constructivist in this paradigms, this menara be possible to positively impact lifestyles.

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ABBREVIATIONS

MS	Metabolic Syndrome
DM2	Type 2 Diabetes Mellitus
CVD	Cardiovascular Disease
WHO	World Health Organization
NCEP ATP III	National Cholesterol Education-Third Adult Treatment Panel
HIV	Human immunodeficiency virus
IDF	Internacional Diabetes Federation
EGIR	European Group for the Study of Insulin Resistance
BMI	Body Mass index
NSHN	National Survey of Health and Nutrition
HTN	Hypertension
LDL-C	Low Density Cholesterol
HDL	Hight Density Lipoprotein

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