

Global Prevalence and Etiology of Metabolic Syndrome

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INTRODUCTION

Metabolic syndrome is a condition diagnosed based on a collection of symptoms that increase an individual's risk of cardiovascular disease and type 2 diabetes. The following 5 symptoms are metabolic risk factors: large waist circumference, low HDL levels, high blood pressure, high triglycerides and high fasting blood sugar ("What Is Metabolic Syndrome?"). The greater the number of risk factors you have, the greater your risk of disease.

Differences in genetics, diet, physical activity patterns, and more all influence the prevalence of both the metabolic syndrome and its components. Regardless of the underlying genetic and environmental influences that mediate the prevalence of the metabolic syndrome, a higher prevalence will undoubtedly lead to undesirable outcomes such as cardiovascular disease (Cameron et al). The United States has one of the highest prevalence of metabolic syndrome, along with China, Malaysia, India, and Turkey. Through lifestyle modifications, it is possible to prevent or delay metabolic syndrome. Successfully controlling metabolic syndrome requires long-term effort and teamwork with your health care providers ("What Is Metabolic Syndrome?").

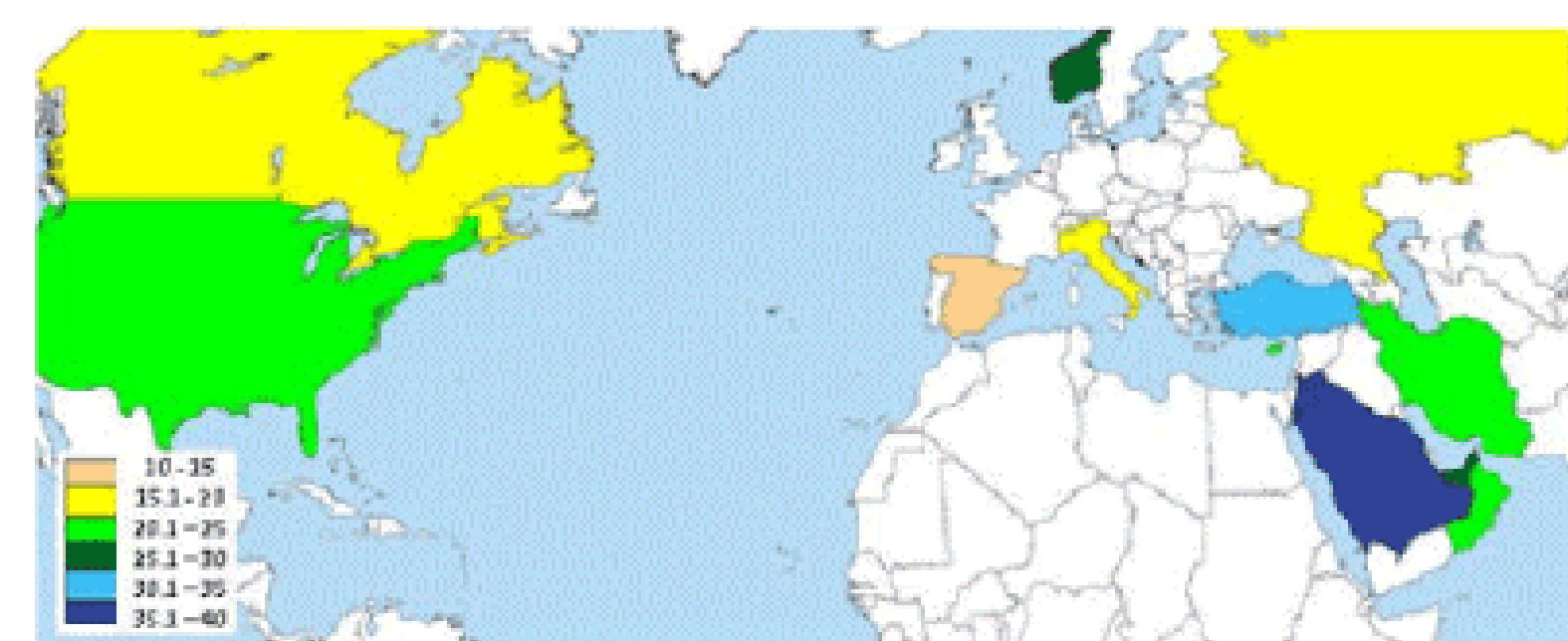


Figure 1: The prevalence of metabolic syndrome in the Middle East, Europe and North America (%)

GLOBAL EPIDEMIOLOGY

Prevalence of metabolic syndrome varies drastically around the globe, both on a country by country basis and at smaller regional levels such as rural, suburban, and urban. Since the 20th century, most countries have seen an increase in the prevalence of metabolic syndrome in the population. Extensive studies have been completed to track the development of the disease in the United States and China. Other countries, such as Malaysia, India, Philippines, Nigeria, Brazil, Turkey, and Iran have also observed metabolic syndrome in greater than 25% of the population.

UNITED STATES

The most recent data for prevalence of metabolic syndrome in the United States showed that, in 2012, 34.7% of the adult population had metabolic syndrome. This exhibits an overall increase from the prevalence in 2003 of 32.9% but a decrease from the peak prevalence in 2007 of 37.3% (Aguilar). This decrease in recent years has been attributed to a greater awareness of metabolic syndrome and its health consequences, which in turn has led to improvements in treating individual components of the disease.

CHINA

Just as in the United States, the prevalence of metabolic syndrome in China has risen in the first decades of the 21st century. However, unlike in the United States, prevalence actually decreased between 2000 and 2010 before rebounding by 2015 to levels above the baseline in 2000 (Li). In 2015, an estimated 24.5% of the population had metabolic syndrome. Certain trends remained constant throughout the tracking of the disease in China; higher rates were observed in females over males, in urban areas over rural or suburban areas, and in people older than 60 years old over those younger than 60. These trends implicate that genetics, lifestyle, and aging all contribute to development of metabolic syndrome.



TURKEY

Turkey has the highest prevalence of metabolic syndrome in the world, with 44.0% of the population diagnosed according to IDF criteria (Gundogan). The study identified trends similar to those seen in the survey of the Chinese population; metabolic syndrome rate was higher in females compared to males and increased with age. The study also identified obesity as an independent risk factor for development of metabolic syndrome. Overweight status increases and person's risk of the disease 2.75 fold compared to normal weight subjects, and obese status increase risk 7.8 fold (Gundogan). However, a 2007 study of the Turkish population found that prevalence in rural areas (33.8%) did not differ significantly from prevalence in urban areas (33.9%) (Kozan).

PHYSICAL ACTIVITY

In a survey conducted in 2010, it was determined that more than two in three American adults are considered to be overweight or obese, and one in three are considered obese. From 1980 to 2000 the prevalence of obesity more than doubled. Today, the number has leaped up to 35.7 (Fryar). The alarming jump in obesity in the United States can be attributed to two main factors: the sedentary lifestyle that the American culture embraces and poor nutritional choices. "Unhealthy dietary habits and sedentary behavior together account for approximately 300,000 deaths every year". "Our society has become very sedentary...43 percent of students in grades 9 through 12 viewed television more than two hours per day" (Office). Our desire for a comfortable, convenient lifestyle with fast results has encouraged our country to adapt accordingly

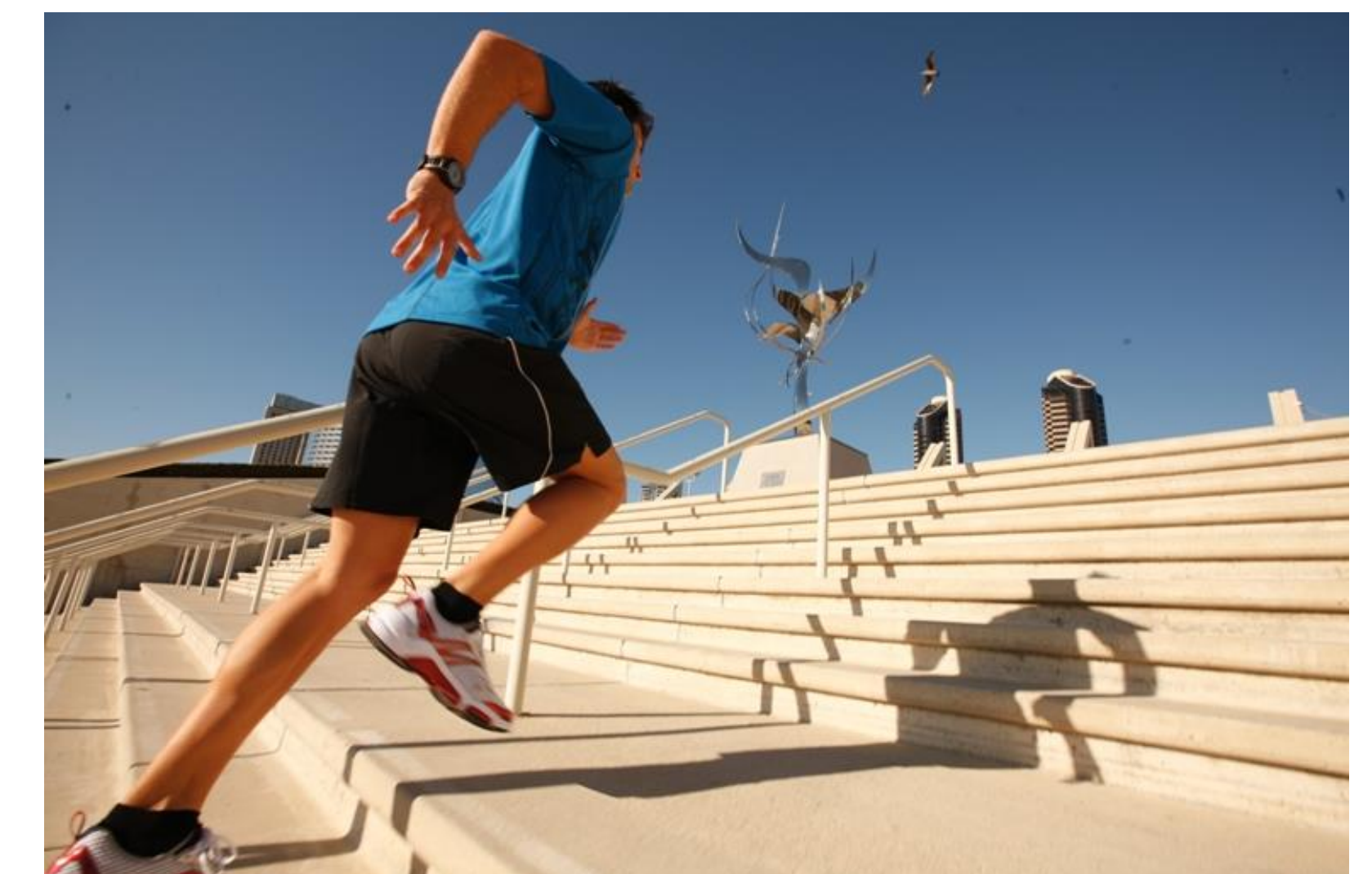
Drive-thrus, for example, have made it possible to quickly purchase foods that are high in fat and are often accompanied by a sweetened beverage, all from the comfort of our own cars. Fast food joints now require no exercise and provide close to 2000 calories per meal. "Several high-quality randomized trials have shown that lifestyle changes in diet and exercise lead to substantial reductions in the incidence of Type II diabetes in patients with "prediabetes". Prediabetes is defined as an impaired fasting glucose or impaired glucose tolerance that does not meet the diagnostic criteria for diabetes" (Vijan). "An estimated 34 percent of the US population have impaired fasting glucose levels" and are therefore at risk to develop diabetes if they don't take measures to change their sedentary lifestyle. With a recommendation of completing merely thirty minutes of physical activity a day to reduce disease risk, it is shocking to find out that 73 percent of women and 66 percent of men fail to do so. In a Women's Health Study that required subjects to walk for 2.5 hours a week, those that were walking than subjects that failed to meet the daily walking goal. In the Kuipio Ischemic Heart Disease Risk Factor Study, men between the ages of 42 and 60 that briskly walked for at least 40 minutes per week were recorded to be 56 percent less likely to develop diabetes than those who lived a completely sedentary lifestyle. Those with the sedentary lifestyle in the study were "more than four times as likely to develop diabetes" as those who met the daily exercise recommendations. In the Da Qing Impaired Glucose Tolerance and Diabetes study, 577 prediabetes men and women were told to change their diets, their exercise patterns, or both. For those who only changed their diet, they reduced their risk for developing diabetes by 31 percent, versus those who changed their diet and exercise pattern were 42 percent less likely to develop diabetes. This study shows the importance of not only tackling the sedentary lifestyle issue, but rather focusing on an entire lifestyle modification that includes a well-rounded diet as well (Bassuk).



GENETICS

Metabolic syndrome is caused by many things including lifestyle but it is also caused by heredity. According to studies Mexican American women are the most predisposed to Metabolic syndrome (McKusick 2001). This is due to the AOMS3 (abnormal obesity-metabolic syndrome) gene on chromosome 17p12. Chromosome 17p12 is not the chromosome responsible for metabolic syndrome. The 17P12 gene is a mutation of the DYRK1B gene on the 19q13 chromosome. Chromosome 17P12 is not the only chromosome responsible for Metabolic syndrome. Another chromosome 3q27 was studied by Kissebah through a 10cm-Map of 2209 patients and was able to link chromosome 3q27 with changes in insulin levels, increase in weight, blood pressure, and waist circumference. Kissebah 2000) Multipoint linkage analysis has also been used in the discovery of a locus for CHD on chromosome 16pter-p13.

(Chromosome 16pter-p13 is linked to high blood pressure which is one of the conditions of metabolic syndrome. (Kissebah, 2000) Another condition of Metabolic syndrome is the collection of excess body fat around the middle of the body. In 2006 a study was done with 1094 females and it was discovered that the 12q24 chromosome had several genes that resulted in excess fat (Wilson 2006). These loci increase the odds of becoming obese not with a poor diet but genetically the human body does not regulate triglycerides and cholesterol efficiently. There is a huge genetic influence on metabolic syndrome and some people are more predisposed to it than others.



TAKE ACTION! GENERAL RECOMMENDATIONS

- Incorporate physical activity throughout entire day
150 minutes of moderate aerobic activity/week or
75 minutes of vigorous aerobic activity/week
- Limit alcohol, sodium, processed foods, and simple sugars
- Aim for 7-8 hours of sleep each night

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