Dietary Means of Reducing Metabolic Syndrome over the Lifespan

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Abstract
Metabolic Syndrome is a grouping of several diseases such as diabetes, hypertension, and cardiovascular disease which alter biochemical processes, making it difficult to perform simple everyday tasks. One of the major factors that alter the prevalence of metabolic syndrome is one's diet. The effects of diet in different age groups range from developmental stages prior to birth to adulthood. A deficiency in several micronutrients (vitamin A, vitamin D, vitamin C) and maternal energy imbalance predisposes the offspring to metabolic syndrome. During adulthood dietary factors that influence metabolic syndrome are excess calories, excess sodium intake, and lack of antioxidants (micronutrients and phytochemicals). Possible interventions to prevent the occurrence of metabolic syndrome include an increase in fruits and vegetables, supplementary intake and a return to traditionally low calorie foods.

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. The greater the number of risk factors you have, the greater your risk of disease. A diet in increased traditional foods and nutrients influences 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. However, through dietary modifications, it is possible to prevent or delay metabolic syndrome. At the same time it is important to understand the underlying mechanisms behind these dietary modifications and how they can help in reducing the effects of metabolic syndrome across the lifespan.

Infancy Growth in Relationship to Energy Balance
Infant energy imbalance leads to a significant role of risk of metabolic syndrome in their later life. Some studies indicate that small for gestational age (SGA) infants and low birth weight infants have a risk of developing obesity and cardiovascular disease. People that gain weight in their first week and up to 4 years after birth tend to be positively associated with risk of obesity [1]. Data from the China National Nutrition and Health Survey in 2002 indicates that people who were born between 1954 to 1964 (especially fetal life and children experienced three years of famine 1959-1961), tended to have a high risk of metabolic syndrome like type 2 diabetes, obesity and hyperglycemia in their adulthood [2]. Unhealthy mothers with poor nutritional status during the gestation period often have infants that are small for gestational age or have a low birth weight. These situations are common in low-income countries and developing countries.

Role of Vitamins in Metabolic Disease

Vitamins and Diabetes
Diabetes is a common metabolic disease that pertains to the body’s inability to respond to insulin resulting in the accumulation of sugar in the body. Many vitamins have a strong relationship with diabetes and insulin signaling. Vitamins that have been shown to reduce the risk associated with metabolic diseases. However, this is only prevalent when the dosage of these vitamins is more than the “normal day-to-day intake”. Vitamin D can act as a hormone, regulators of tissue growth and cell differentiation. Vitamin D is able to reverse the effects the suppression of insulin signaling that is prevalent in patients with diabetes. This results in an increase the body’s sensitivity to insulin and as well as the suppression of the overactive PEPCK gene. Diabetes can lead to micro vascular disease which also pertains to metabolic disease. Derivatives of vitamins B1 and B6 mitigate the severity of this disease. Figure 2 shows graphically the way these vitamins work together. Vitamin D inhibits the chemokines and cytokines (by NF-κB signaling). These vitamins work together to prevent the formation of inflammatory prostaglandins to prevent insulin resistance. When there are insufficient levels of vitamin D in the system, parathyroid hormone increases, resulting in a reduction of insulin sensitivity. [3]

Antioxidants
The presence of antioxidants and phytochemicals in the diet are also shown to alleviate effects of metabolic disease. Researchers have observed how consumption of foods like lemons and oranges (rich in substances like vitamins C and antioxidants) lead to a decrease in the effects of metabolic disease. Scientifically vitamin C plays an important role in the immune system. Cells in the immune system require vitamin C in order to reduce the effect of pathogens. It has also been studied that vegetarians who have a much higher intake in antioxidants are shown to have lower hypertension and lower blood pressure. Therefore, it is recommended to increase consumption of nuts, seeds, fish, and fruits. Plant rich diets are helpful in reducing metabolic disease symptoms. These nutrients are known as phytochemical and are found in green leafy substances, colorful fruits and roots. [4]

Return to Traditional Foods

Mexican
There are many different traditional foods that may decrease the risk of metabolic Syndrome. The increase rate of obesity is related to the increase in prevalence of Metabolic Syndrome. A good example is the food of Mexico with a very different traditional food compared to other countries. A diet study using the traditional maize tortilla, showed that it reduced HbA1c as compared to either maize pozo or no maize. Metabolic Syndrome are significant higher HbA1c which is related to diabetes and can indicate people with prediabetes or diabetes. The rate for diabetes is 6.5% or over and prediabetes is 6.0%-6.4%, those below 6.0% as normal. This study suggests that traditional food may decrease the progression of diabetes. Additionally, in the experiment there was a significant 30% reduction of LDL-cholesterol (figure 3). High levels LDL-cholesterol can lead to serious health problems such as heart disease and stroke. Therefore, eating traditional food of maize tortilla may help reduce of HbA1c and LDL compared with the group with no supplements and the group provided with maize pozo. As a result, this clearly shows that eating a traditional Mexican food can reduce of metabolic syndrome. [7]

Conclusion
An increase in nutrient rich diet as well as the return to more traditional foods is likely to reduce the effects of metabolic syndrome as well as provide a better life for the individual. This is important during life and before it in the case of pregnant mothers. It is important for patients with metabolic syndrome to commit to a healthier lifestyle in order to alleviate the symptoms of the disease. Altering eating habits is a small price to pay for a better functioning body as well as a healthier future.

References
[6] Pregnant women are vitamin D deficient. Map 2013